

Compensatory Mitigation Plan

Executive Summary

Donlin Gold, LLC (Donlin Gold) is proposing the development of an open pit, hard rock gold mine in Alaska. The mine is located 277 miles west of Anchorage, 145 miles northeast of Bethel, and 10 miles north of the village of Crooked Creek on the Kuskokwim River. Bethel, the largest community in western Alaska, is the administrative and transportation center of the Yukon-Kuskokwim (Y-K) Delta. The proposed Jungjuk (Angyaruaq) Port site is approximately 178 river miles upstream of Bethel, and about 57 river miles upstream of Aniak, the regional transportation center for the middle Kuskokwim Valley.

The minerals at the Project are owned and were selected by Calista Corporation (Calista), an Alaska Native regional corporation, under the authority of the Alaska Native Claims Settlement Act (ANCSA) in partial compensation for the extinguishment of Alaska Native title claims. Most of the surface lands at the site are owned by The Kuskokwim Corporation (TKC), an Alaska Native village corporation comprising the ten Alaska Native villages closest to the site. Donlin Gold operates the Project pursuant to a Mining Lease with Calista and a Surface Use Agreement (SUA) with TKC.

Donlin Gold submitted a Preliminary Application for the Department of the Army Permit (DA Permit) to the United States Army Corps of Engineer (USACE) in July 2012, pursuant to Clean Water Act (CWA) Section 404 and Rivers and Harbors Act of 1899 (RHA) Section 10. In December 2012, USACE published a Notice of Intent to prepare an Environmental Impact Statement (EIS) for the Donlin Gold Project (Project). Donlin Gold updated its DA Permit application in December 2014 and August 2015. The Draft EIS and the DA Permit application were released for public comment in November 2015. Donlin made a final update to its DA application in December 2017. Donlin Gold's Conceptual Compensatory Mitigation Plan (CMP) was submitted in November 2015 and a CMP was included with the December 2017 DA application. The Final EIS was released in April 2018 along with a Special Public Notice (SPN) soliciting public comments on the 2017 CMP. This Final CMP responds to agency and public comments on the SPN.

In 2008, the USACE and the United States Environmental Protection Agency (EPA) published regulations (33 Code of Federal Regulations [CFR] 332; 40 CFR 230) entitled, "Compensatory Mitigation for Losses of Aquatic Resources" (Mitigation Rule, or Rule). The Rule emphasized the selection of compensatory mitigation sites on a watershed basis and established operating standards for mitigation providers and mechanisms: mitigation banks, in-lieu fee (ILF) programs, and permittee responsible mitigation (PRM) Plans. Where the Project's permanent impacts primarily occur in the Crooked Creek watershed (Hydrologic Unit Code [HUC]-10 definition), no approved mitigation banks can provide credits currently, or in the timeframe of the Project permitting process. There are also no statewide ILF providers. Hence, the Project is proposing all compensatory mitigation for permanent fill impacts in the Crooked Creek watershed through PRM Plans.

Donlin Gold has evaluated all available and practicable options to assure compliance with the provisions of the Rule and the 1994 Alaska Wetland Initiative (EPA et al. 1994) through PRM alternatives, focusing first on the immediate (HUC-10) watershed and then systematically assessing larger hydrologic units (e.g., HUC-08, HUC-06, HUC-04) for compensatory mitigation opportunities. This assessment specifically included a detailed examination of the current land conditions in the Crooked Creek drainage to determine restoration opportunities.

The Project design avoids and minimizes fill impacts to wetlands and streams to the maximum extent practicable. Some Project activities in wetland areas include vegetation clearing, winter roads, and work areas where no fill placement will occur. For these activities, no compensatory mitigation credit is being proposed.

Permanent fill impacts from the proposed Project total 2,876 acres of wetlands and 173,953 linear feet (32.9 miles) of streams. The Mine Area (MA) and Transportation Area (TA) will permanently fill 2,676 wetland acres and 173,953 (32.9 miles) linear feet of streams, and the Pipeline Area (PA) includes 200 acres of permanent wetland fill with no permanent fill impacts to streams.

Donlin Gold proposes two PRM Plans, and a limited purchase of mitigation bank credits to offset the Project permanent fill impacts. They are:

- The Upper Crooked Creek PRM Plan (Attachment D) will yield substantive, near-term benefits to aquatic resources. The Upper Crooked Creek PRM Plan includes the enhancement, reestablishment, restoration, rehabilitation and preservation of wetlands, riparian areas, stream channels, and uplands within 221.5 acres. The PRM Plan will restore degraded acreage in Quartz, Snow, Ruby and Queen gulches, and at the Wash Plant Tailings Area. The PRM Plan will restore 95.7 acres of degraded floodplains into 93.0 acres of wetlands and 2.75 acres of riverine channel. A total of 8,892 linear feet of stream will be enhanced and reestablished by the restoration work in the floodplain. Within the wetland floodplain 15.2 acres of off channel ponds will be enhanced for aquatic resources. In addition, there will be 16.8 acres of adjacent upland terrestrial habitat enhanced in upper Crooked Creek. A total of 109 acres of riparian uplands, and wetland buffers will be protected around the restored and enhanced floodplain wetlands. This PRM will be initiated concurrent with the start of MA construction.
- The Chuitna PRM Plan (Attachment E) will preserve 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of Waters of the United States (WOUS). It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. Donlin Gold will execute preservation of the parcel concurrently with work authorized in the DA application for the Project.
- Prior to initiating Project construction, Donlin Gold has secured and will purchase 9.80 wetland mitigation credits from the Great Land Trust (GLT). GLT received USACE approval in June 2018 for 229 mitigation bank credits within the Matanuska-Susitna Borough (MSB) boundaries. A portion of the permanent impacts from the PA are located within the GLT's service area.

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Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AMHT	Alaska Mental Health Trust Authority
amsl	above mean sea level
ANCSA	Alaska Native Claims Settlement Act
Angler	Angler Mining Pty, Ltd.
ARMP	Aquatic Resources Monitoring Plan
ATV	All-Terrain Vehicle
AWC	Anadromous Waters Catalog
AWI	Alaska Wetlands Initiative
BLM	Bureau of Land Management
BMP	Best Management Practice
BSW	Black Spruce Woodland
Calista	Calista Corporation
CAS	Closed Alder Shrub
CBM	Coal Bed Methane
Cells	Material Site Excavation Area
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIRI	Cook Inlet Regional Incorporated
CMP	Compensatory Mitigation Plan
CWA	Clean Water Act
DA	Department of the Army
Donlin Gold	Donlin Gold, LLC
DSSR	Disturbance-related shrub and sapling re-growth
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERDC	U.S. Army Engineer Research and Development Center
ESA	Endangered Species Act of 1973
FR	Federal Register
FVP	Field Verification Points
GPS	Global Positioning System
GLT	Great Land Trust
Hansen	Hansen Industries, Inc.
HDD	Horizontal Directional Drilling
HGM	Hydrogeomorphic
HMU	Habitat Mapping Unit
HUC	Hydrologic Unit Code
ILF	In-Lieu Fee
IR	Invasiveness Rank
LGL	LGL Alaska Research Associates, Inc.

LMP	Long-term Management Plan
LST	Low Shrub Tundra
m ²	meter-squared
MA	Mine Area
MH	Mesic Herbaceous
Michael Baker	Michael Baker International
MLRA	Major Land Resources Areas
MSC	Material Site Closure
MSB	Matanuska-Susitna Borough
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OAS	Open Alder Shrub
OAWS	Open Alder Willow Shrub
OBSF	Open Black Spruce Forest
OWS	Open Willow Shrub
OWSF	Open White Spruce Forest
PA	Pipeline Area
PAF	Preservation Adjustment Factor
PJD	Preliminary Jurisdictional Determination
PRC	PacRim Coal
Preservation Area	Chuitna Preservation Area
PRM	Permittee Responsible Mitigation
Project	Donlin Gold Project
Refuge	Togiak National Wildlife Refuge
RHA	Rivers and Harbors Act of 1899
RPW	Relatively Permanent Waters
Rule	Mitigation Rule (33 CFR 325 and 33 CFR 332; 40 CFR 230)
SC	Stream Crossing (Points)
sq. mi.	square mile
SUA	Surface Use Agreement
TA	Transportation Area
TKC	The Kuskokwim Corporation
TNC	Tyonek Native Corporation
TNW	Traditional Navigable Waters
TSF	Tailings Storage Facility
UCG	Underground Coal Gasification
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WB	Waterbody (Points)

WBM	Water Balance Model
WBM	Water Balance Model
WD	Wetland Determination
WH	Wet Herbaceous
WMF	Woodland Mixed Forest
WOUS	Waters of the United States
WQS	Water Quality Standards
WRF	Waste Rock Facility
Y-K	Yukon-Kuskokwim

Compensatory Mitigation Plan

1.0 Introduction

Purpose

Donlin Gold, LLC (Donlin Gold) is proposing to mine and process gold ore at a site in the Crooked Creek watershed, which is part of the Kuskokwim River drainage in Alaska. Calista Corporation (Calista), an Alaska Native regional corporation, selected the mineral rights at the Donlin Gold site under the Alaska Native Claims Settlement Act (ANCSA) because of the site's known gold potential. The Kuskokwim Corporation (TKC), an Alaska Native village corporation, owns the majority of the surface estate at the Donlin Gold site. ANCSA mandates that Calista develop the mineral resources at Donlin Gold for the benefit of Calista's shareholders and the shareholders of other Alaska Native corporations which benefit from natural resource development through ANCSA 7(i) and (j) revenue distribution requirements. Donlin Gold operates the Donlin Gold Project (Project) under a mineral lease with Calista and a surface use agreement with TKC. This Compensatory Mitigation Plan (CMP) explains how Donlin Gold will compensate for the unavoidable losses of Waters of the United States (WOUS) including wetlands, streams, ponds, and creeks in the Project area.

On April 10, 2008, the United States Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (EPA) published regulations (33 Code of Federal Regulations [CFR] 332; 40 CFR 230) entitled, "Compensatory Mitigation for Losses of Aquatic Resources" (Mitigation Plan, or Rule). The Rule emphasized the selection of compensatory mitigation sites on a watershed basis and established operating standards for mitigation providers and mechanisms: mitigation banks, ILF programs, and permittee responsible mitigation (PRM) plans. Prior to the Rule, EPA, USACE, United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) issued the Alaska Wetland Initiative (AWI) (EPA et al. 1994). This initiative clarified that "no net loss of wetlands" was not realistic or practicable in Alaska and there was minimal justification for comprehensively implementing a mitigation program designed for the Contiguous United States and not Alaska. The Rule recognizes the provisions of the AWI as valid and still applicable for mitigation planning in Alaska. This CMP follows the AWI guidance, and the recently released June 15, Memorandum of Understanding (2018 MOU) between USACE and EPA regarding Mitigation Sequence for Wetlands in Alaska under Section 404 of the Clean Water Act (CWA).

This CMP discusses the proposed Project and compensatory mitigation plans for permitting under the CWA Section 404 and the Rivers and Harbors Act of 1899 Section 10.

2.0 Proposed Project

The open pit, hard rock gold mine site is located 277 miles west of Anchorage, 145 miles northeast of Bethel, and 10 miles north of the village of Crooked Creek. The village of Crooked Creek is located on the banks of the Kuskokwim River. The proposed mining Project includes the following principal mine components:

- Mine Area (MA) – Includes an open pit mine, waste rock facility (WRF), processing facility, tailings storage facility (TSF), fresh water dams, contact water dams, a natural gas power generation facility, and personnel camps.

- Transportation Area (TA) – Includes a 5,000-foot gravel airstrip, Jungjuk (Angyaruaq) Port on the Kuskokwim River, and a 30-mile gravel road connecting the port and MA.
- Pipeline Area (PA) – Includes a 14-inch, 315-mile buried steel pipeline to supply natural gas to the mine power plant. The pipeline ties into Enstar’s gas distribution line near Beluga and traverses 315 miles through the Alaska Mountain Range to the power plant and processing facility as shown in Figure 1.

Project components are shown in Figure 1 and Figure 2. Additional details about the proposed Project can be found in the Project Description, Natural Gas Pipeline Plan of Development (SRK 2016) and the Department of the Army (DA) Permit and revisions (Donlin Gold 2012, 2014, 2015, and 2017).

3.0 Donlin Gold Section 404 and Section 10 Permitting

Donlin Gold initiated the permitting process by submitting a Preliminary DA Permit application package under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act of 1899 (RHA) to USACE on July 26, 2012. The package included an initial Preliminary Jurisdictional Determination (PJD) and the DA Permit application. Donlin Gold subsequently submitted a revised DA Permit application to USACE in December 2014. Another update to the application was submitted to USACE in August 2015, which was public noticed with the Draft Environmental Impact Statement (EIS). A revised PJD incorporating additional field work was submitted to USACE in January 2017. On February 27, 2017, USACE accepted the revised PJD, which refined the boundaries of the WOUS subject to USACE jurisdiction for the Project. In July 2017, Donlin Gold completed the North Route pipeline re-alignment and wetland mapping. Updated data reflecting the North Route were provided to USACE in August 2017, and accepted in October 2017. A further revision to the DA Permit application, including the North Route data and a CMP, was submitted to USACE in December 2017. The Final EIS was released in April 2018 along with a Special Public Notice (SPN) soliciting public comments on the 2017 CMP. This Final CMP responds to agency and public comments on the SPN. Table 1 summarizes the relevant Donlin Gold permit submittals

Table 1 Donlin Gold DA Permit Application Submissions and Supporting Documentation to USACE

Document Name	Submitted to USACE
Preliminary DA Permit Application (Engineer Form 4345) and Initial PJD	July 2012
DA Permit Application (Engineer Form 4345)	Updated December 2014 and August 2015
PJD Donlin Gold Project - December 2016	January 2017
North Route Addendum to the PJD Donlin Gold Project - August 2017	September 2017
DA Permit Application (Engineer Form 4345) including CMP	December 2017
Final CMP addressing agency and public comments	July 2018
PJD Chuitna Preservation Area	Scheduled Late July 2018

Figure 1 Mine Area and Transportation Area

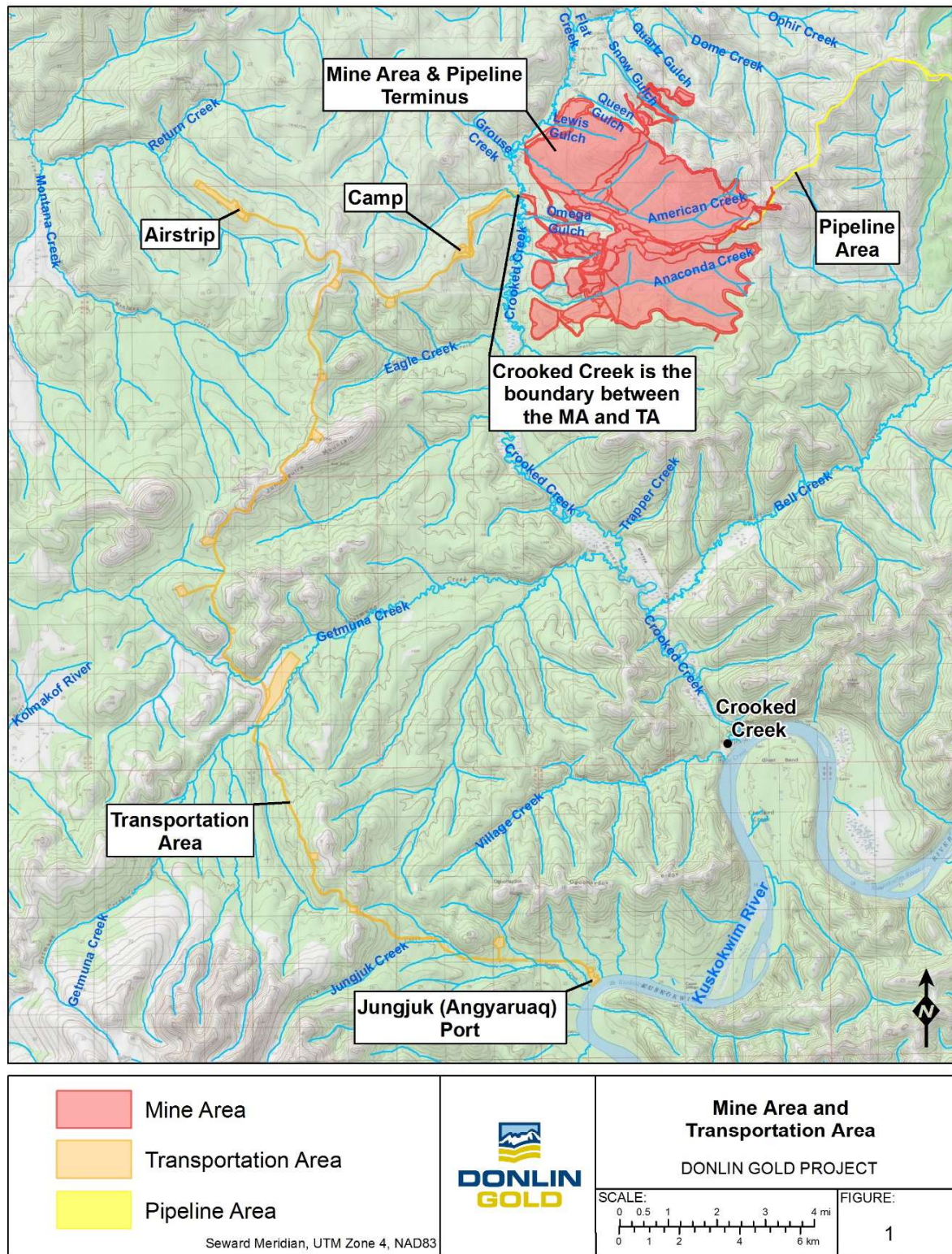
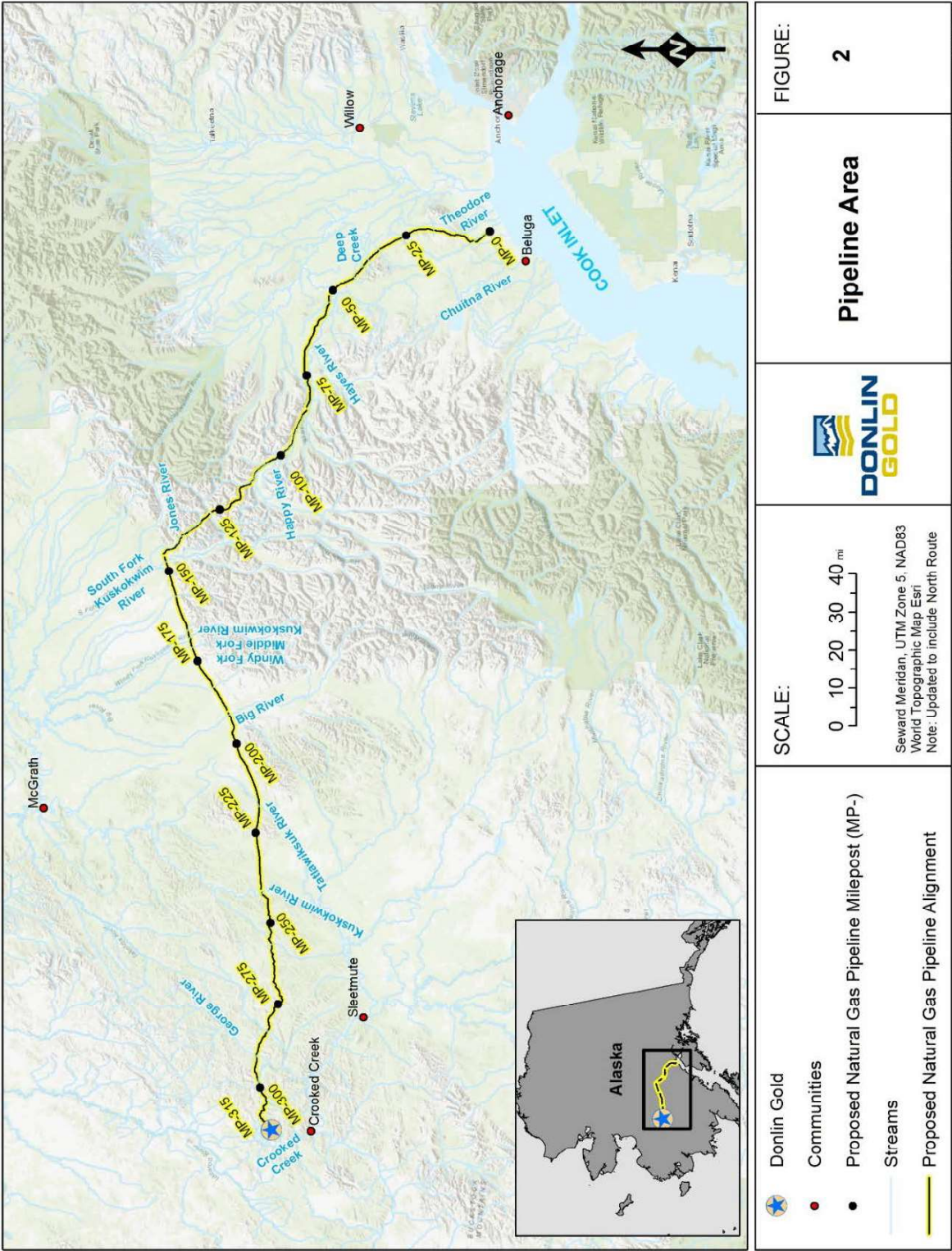


Figure 2 Pipeline Area



4.0 Wetland Fill Impacts from Proposed Project

The development of the Project will discharge fill that will result in permanent fill in wetlands and WOUS. The calculated Project wetlands disturbance and fill activities are in Blocks 21 and 22 of the December 2017 DA Permit.

The Project fill impacts are summarized into three areas: the MA, which includes all mine-related facilities east of Crooked Creek; the TA, which includes all transportation-related facilities west of Crooked Creek; and the PA, which includes the natural gas pipeline and ancillary facilities (see Figure 1 and Figure 2).

Wetland fills were calculated using geospatial data and geographic information systems data analysis tools. The data used included the Project PJD wetlands map, as accepted by USACE and the Project footprint. These datasets were overlain to calculate the Project fill impacts to WOUS. The results are described in the following sections.

Wetlands Fill Impact Types

Wetland fill impacts for the Project are grouped into two main categories: non-regulated and jurisdictional.

- *Non-regulated Impacts* – This impact category includes vegetation clearing, winter roads, and work areas where no fill placement is planned in wetlands or WOUS. These impact types are not addressed by this CMP.
- *Jurisdictional Impacts* – These impacts include the placement of fill into wetlands or WOUS that require approval by USACE through its permitting authorities. These fill impacts are addressed in the CMP.

The impact types are further divided in the DA permit application based on the duration of the fill:

- *Temporary Short-term Fill* – These are areas where fill is placed into wetlands or WOUS for a limited period during construction to facilitate activities, then removed concurrent with construction activities or as soon as construction is complete. This fill may be in place for a matter of days or up to three years. Donlin Gold has not proposed compensatory mitigation for temporary short-term fill impacts.
- *Temporary Long-term Fill* – This category represents cut and fill activities where the fill will be removed more than three years after initial placement. At the request of USACE, temporary long-term fill has been combined with permanent fill in calculating fill impacts for the Project.
- *Permanent Fill* – This category represents cut and fill activities at facility locations where the fill will not be removed from WOUS. This includes the open pit, TSF, and WRF. The fill cannot practicably be removed from the TSF and WRF because of the large volumes of fill in each facility. The open pit will be partially backfilled at mine closure, but cannot practicably be fully backfilled.

Wetlands and Aquatic Resource Fill Impacts

Wetlands and waters have been characterized by Hydrogeomorphic (HGM) classification (Brinson 1993); vegetation type based on a modified Viereck classification system (Viereck et.al. 1992); and Cowardin classification (Cowardin et al. 1979).

Mine Area and Transportation Area

Stream fill impacts¹ are presented in Table 2. Stream fills have been subdivided by stream channels filled that are anadromous or non-anadromous. The MA and TA permanent stream fills are 173,953 linear feet (32.9 miles). The MA and TA include a total of 2,676 acres of permanent wetland fill. Table 3 provides a summary of the MA, TA, and PA temporary and permanent wetland fill by area.

Pipeline Area

PA fill impacts account for pipeline crossings (open cut with stream diversions) and for temporary access across streams. All fill in streams is temporary because it is removed during reclamation and restoration. Wetland fill to streams is presented in Table 2. All the PA stream fills are short-term temporary and total 53,346 linear feet (10.1 miles). The PA includes 538 acres of temporary fill and 200 acres of permanent fill in wetlands. Table 3 provides a summary of the PA wetland fill by duration.

The PA traverses 28 Hydrologic Unit Code (HUC)-10 watersheds. The 200 acres of permanent wetland fill impacts from the pipeline are in 14 of those HUC-10 watersheds. These watersheds have very limited existing disturbance. The maximum permanent wetland fill impact from PA construction in any single HUC-10 watershed is 64 acres (Headwaters Tatlawiksuk River). For the PA construction, the maximum total wetland disturbance in a watershed is 0.03 percent of the total watershed area. Additional details on the PA fill impacts by HUC-10 watershed are provided in Attachment A.

¹ The stream impacts are measured along the channel centerline within the MA, TA, or PA and categorized by the duration. Stream length is measured in linear feet (miles) within the jurisdictional streams listed in Donlin Gold's 2016 PJD prepared by Michael Baker International.

Table 2 Project Mine Area, Transportation Area, and Pipeline Area Stream Fills in Linear Feet (Miles)

HGM	Cowardin Group	MA			TA			PA		
		Temporary	Permanent	Permanent	Temporary	Permanent	Permanent	Temporary	Permanent	Permanent
Anadromous Stream Channel	Intermittent	0	0	0	0	0		10,992 (2.1)	0	0
	Perennial	0	2,218 (0.4)		0	0	Stream	42,353 (8.0)	0	0
Non-Anadromous Stream Channel	Intermittent	0	37,901 (7.2)		0	774 (0.1)	Channel			
	Perennial	0	130,882 (24.8)		0	2,178 (0.4)				
Total		0	171,001 (32.4)		0	2,952 (0.5)		53,346 (10.1)	0	0

* Inconsistencies are due to rounding.

Table 3 Project Mine Area, Transportation Area, and Pipeline Area Wetlands Fill: HGM Class and Cowardin Group (Acres)

HGM	Cowardin Group	MA		TA		PA	
		Temporary	Permanent ¹	Temporary	Permanent ¹	Temporary	Permanent
Depressional	Palustrine Aquatic Bed (Pond)	0	0	0	0	0	0
	Palustrine Emergent	0	3	0	0	3	0
	Palustrine Forested	0	0	0	0	2	0
	Palustrine Scrub Shrub	0	0	0	0	3	0
	Palustrine Unconsolidated Bottom (Pond)	0	0	0	0	0	0
	Depressional Total	0	3	0	0	8	0
Flat	Palustrine Emergent	0	2	0	0	20	25
	Palustrine Forested	0	508	0	9	58	17
	Palustrine Scrub Shrub	0	1,052	0	53	220	109
	Flat Total	0	1,562	0	62	298	151
Riverine Non-Anadromous	Palustrine Emergent	0	4	0	2	4	0
	Palustrine Forested	0	35	0	1	1	0
	Palustrine Scrub Shrub	0	113	0	0	12	1
	Palustrine Unconsolidated Bottom (Pond)	0	0	0	0	0	0
	Riverine Non-Anadromous Total	0	152	0	3	17	1
Riverine Anadromous	Palustrine Emergent	0	1	0	0	2	1
	Palustrine Forested	0	3	0	0	2	0
	Palustrine Scrub Shrub	0	0	0	1	11	1
	Palustrine Unconsolidated Bottom (Pond)	0	0	0	0	0	0
	Riverine Anadromous Total	0	4	0	1	15	2
Slope	Palustrine Emergent	0	31	0	1	15	2
	Palustrine Forested	0	322	0	18	52	6
	Palustrine Scrub Shrub	0	496	0	21	133	38
	Slope Total	0	849	0	40	200	46
Total		0	2,570	0	106	538	200

*Inconsistencies are due to rounding.

1. Temporary long-term fill has been combined with permanent fill for purposes of determining compensatory mitigation requirements.

5.0 Evaluation of Compensatory Mitigation Options

The Rule specifically establishes a watershed-based framework for determining appropriate types of compensatory mitigation. Under the Rule, compensatory mitigation can be carried out through four methods:

1. Restoration of a previously existing aquatic site
2. Enhancement of an aquatic site's function
3. Establishment of a new aquatic site
4. Preservation of an existing aquatic site

In the Rule, the concepts of aquatic sites and resources are considered together. The key element is that proposed compensatory mitigation must relate directly to unavoidable fill impacts to aquatic resources. On a watershed level, Donlin Gold's unavoidable fill impacts are largely concentrated on aquatic resources (anadromous and resident fish) in the Crooked Creek watershed. Therefore, in determining what compensatory mitigation to propose, each option was evaluated in terms of how it could be directly compared to these watershed fill impacts to aquatic habitat for fish species. In addition, 33 CFR 332.3(a) recommends that larger contiguous tracts are preferred to help comply with the watershed approach for mitigation. Hence, Donlin Gold's search prioritized larger singular options rather than numerous small ventures spread over broad areas and numerous watersheds.

The Rule also establishes several distinct types of mitigation, including mitigation bank credits, ILF credits, and numerous forms of PRM. Throughout the U.S., compensatory mitigation is often provided through mitigation bank and ILF programs. In remote areas of Alaska, however, the availability of these programs is very limited. Donlin Gold evaluated the feasibility of purchasing credits from the existing organizations. The Conservation Fund's ILF program has been the only program that provided credits for the entire state. Advance credit transactions were suspended on May 19, 2017, and as of October 2017, The Conservation Fund could no longer offer any mitigation credits in Alaska.

Mitigation banks are assigned service areas and can generally only be used for developments with fill impacts within those established service areas. The only mitigation bank that is established and has a service area that overlaps any identified Project fill impacts for which Donlin Gold is seeking CWA Section 404 permit coverage is the Su-Knik Bank in the Matanuska-Susitna Borough (MSB). The Great Land Trust recently (June 2018) received approval of wetland mitigation program credits for wetland impacts within a service area that generally comprise the MSB boundaries. Donlin Gold has committed to acquire 9.8 wetland credits from the Great Land Trust for the permanent wetland fill impacts associated with the PA within the MSB. See Table 23 for the mitigation credits proposed for purchase.

As discussed above, the existing ILF programs and mitigation banks do not have service areas that cover most of the Project impact areas and cannot meet the mitigation needs for the permanent fill impacts associated with the MA and TA, and portions of the PA not within the MSB. This left Donlin Gold with only the PRM option under the Rule for achieving compensatory mitigation requirements via one or more of the four methods above: considering on-site and in-kind projects first, then expanding to out-of-kind and, if needed, off-site mitigation. Another key aspect involved determination of the amount of

mitigation. There is no accepted functional assessment for the wetlands impacted.² Under 33 CFR 332.3(f)(1), when no functional assessment is available, “a minimum one-to-one [1:1] acreage or linear foot compensation ratio must be used.” Under 33 CFR 332.3(f)(2), consideration on the amount of mitigation also needs to consider the method, likelihood of success, differences in functions (or type) of wetlands, temporal losses and the distance between the impact and mitigation site. Donlin Gold proceeded with these goals and guidance in mind (see Section 8.0).

On-Site Options

Donlin Gold evaluated numerous compensatory mitigation opportunities for the permanent fill impacts associated with the MA, TA, and PA. The most concentrated permanent, unavoidable Project fill impacts occur in the Crooked Creek HUC-10 watershed. In other watersheds associated with the PA, the permanent wetland and stream fill impacts comprise only very small percentages of HUC-10 watersheds (0.03 percent or less of the total watershed areas within each HUC crossed). Therefore, in evaluating mitigation options, and in keeping with 33 CFR 332.3(b)(4) (PRM) and 33 CFR 332.3(c) (watershed approach) relating to compensatory mitigation, Donlin Gold first focused on opportunities within the HUC-10 watershed of the MA (i.e., generally the Crooked Creek drainage) and then extended to the HUC-10s associated with the TA. The only existing developed areas in these hydrologic units are the village of Crooked Creek, the existing Donlin Gold camp supporting exploration activities, and the placer mining activity around the upper Crooked Creek and Donlin Creek confluence. Among these, the sole opportunity to provide immediate on-site and in-kind compensatory mitigation for Project fill impacts to aquatic resources is to restore past placer mining disturbances in upper Crooked Creek and several of its tributaries (Quartz, Snow, Ruby, and Queen Gulches). These restoration and mitigation activities are directly applicable to the MA and TA fill impacts because they represent in-kind wetland and stream channel restoration, enhancement, and long-term preservation within the HUC-10 of the MA and some of the TA activities.

The proposed Upper Crooked Creek PRM Plan is provided in Attachment D and is designed to:

- Restore geomorphically stable channels and floodplains in the lower reaches of Quartz, Snow, Ruby, and Queen Gulches and enhance the aquatic habitat.
- Remove barriers to fish passage and improve anadromous and resident fish-rearing habitat in the reaches of Snow, Ruby, and Queen Gulches fill-impacted by placer mining.
- Preserve restored wetlands and aquatic habitat by creating riparian buffers around the restoration areas.

Donlin Gold will implement the Upper Crooked Creek PRM Plan concurrently with the start of MA and TA development. The Upper Crooked Creek PRM Plan includes the enhancement, reestablishment, restoration, rehabilitation and preservation of wetlands, riparian areas, stream channels, and upland

² Donlin Gold generated a full functional assessment using the Hollands-Magee method in 2014, which was determined inappropriate by the U.S. Army Engineer Research and Development Center (ERDC). Donlin Gold proposed a second methodology in 2016 using Cowardin and a functional capacity index combined with an HGM method that was determined by USACE to be inappropriate for this situation.

buffers totaling 221.5 acres in Quartz, Snow, Ruby and Queen Gulches, and the Wash Plant Tailings Area. The PRM Plan will specifically restore 95.7 acres of degraded floodplains into 93.0 acres of wetlands and 2.7 acres of riverine channel. A total of 8,892 linear feet of stream will be enhanced and reestablished by the restoration work in the floodplains. A total of 109 acres of riparian uplands, and wetland buffers will be protected around the restored and enhanced floodplain wetlands.

Beyond the Upper Crooked Creek PRM Plan, Donlin Gold will restore areas within the MA and TA as wetlands to the maximum extent practicable when they are no longer needed for Project activities. This includes both material and stockpile areas as described in the MA Restoration Plan included as Attachment C, and the TA Restoration Plan included as Attachment F. The MA Restoration Plan provides for restoration of 556 acres of wetland and 6,363 linear feet of stream. The TA Restoration Plan provides for 34.7 acres of wetland restoration. Donlin Gold is not requesting compensatory mitigation credit for these Restoration Plans but is committing to those projects as part of the Project minimization efforts.

Donlin Gold broadly considered the current surface conditions/disturbances in the watersheds of the PA for potential mitigation opportunities for fill impacts from pipeline construction. Donlin Gold evaluated the viability of restoring locations in these watersheds previously impacted by development. An analysis by HUC of existing impervious cover was done to facilitate potential restoration areas. The pipeline crosses 28 HUC-10 watersheds over its 315-mile length. The analysis showed total impervious cover across all HUC-10s before pipeline construction comprises only 0.04 percent of the HUCs, and no HUC had any practicable, substantive restoration opportunities. Overall, there is little to no existing disturbance to restore in the proximity of the PA. See Attachment A for additional details on PA wetland impacts. Compensatory mitigation for the PA effects may not be required due to the very limited (<0.05 percent) effect within each HUC-10 watershed crossed. However, Donlin Gold has included this acreage in this plan to account for these impacts.

Off-Site Options

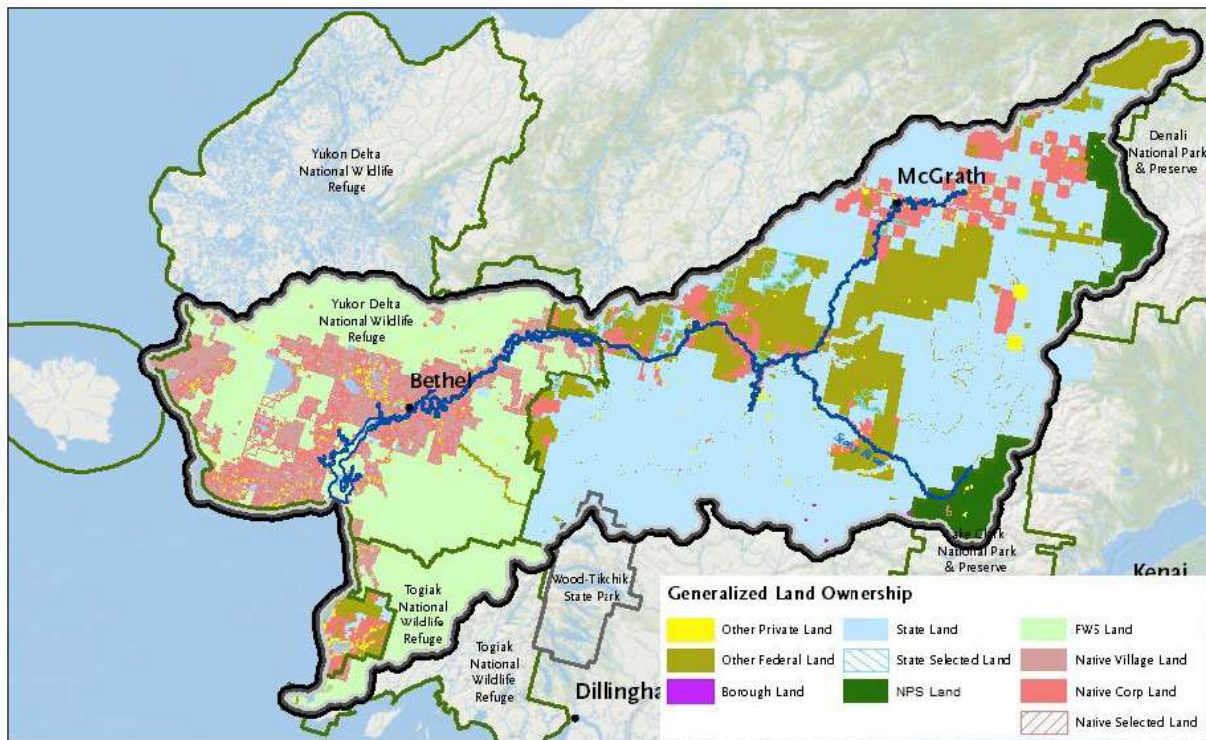
To further compensate for the Project fill impacts to achieve the minimum 1:1 ratio under the Rule, Donlin Gold considered additional off-site mitigation opportunities. Table 4 summarizes the specific off-site mitigation options Donlin Gold considered for the Project and describes the potential applicability of the mitigation option to this CMP. The following guidelines were applied to each off-site opportunity:

- Identify restoration and preservation opportunities that would yield watershed-level aquatic resource mitigation comparable to the MA and TA fill impacts; specifically, restoration and/or preservation of wetland acres and stream miles, with specific focus on anadromous and other important fish and wildlife populations.
- Identify any credits readily available from Mitigation Banks or ILF programs where Project impacts are within the service areas of the providers.
- For restoration opportunities, consider options that can be demonstrated to yield ecological “lift” (an increase in functions and services in the wetlands) in both a practicable and measurable manner.

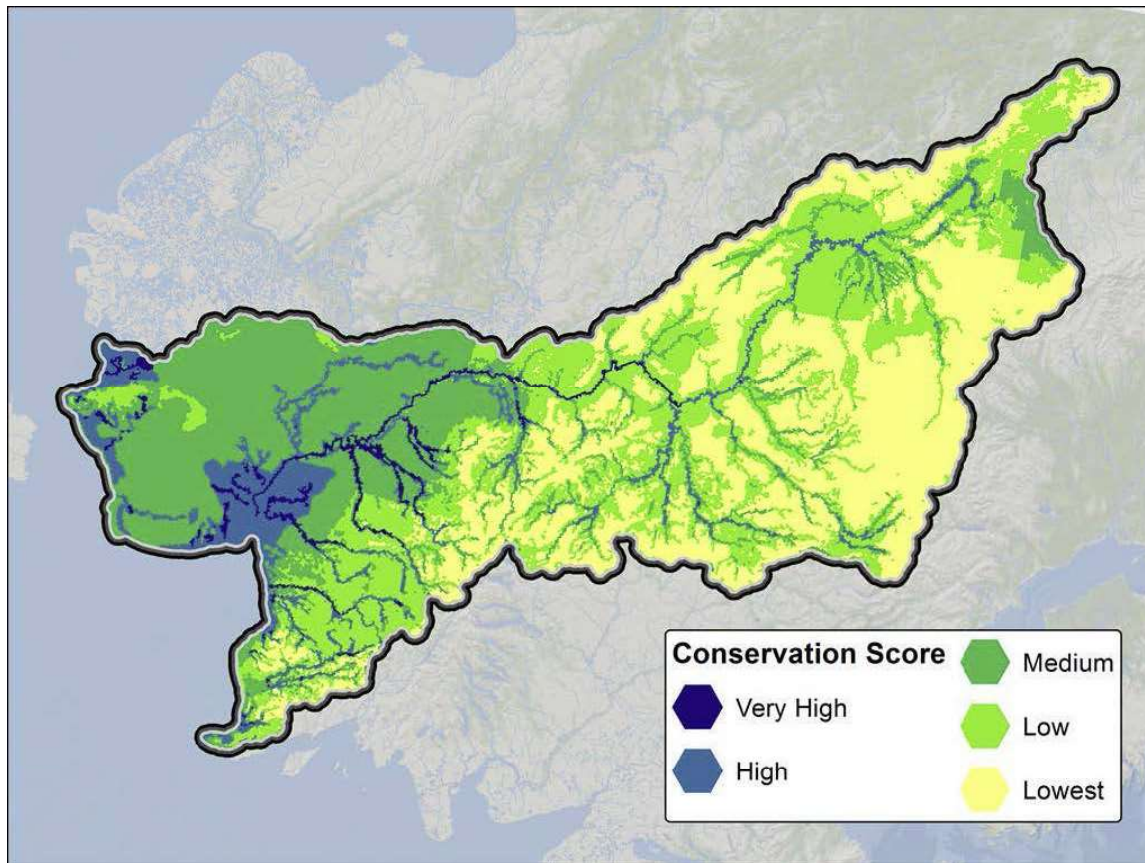
- For preservation opportunities, show a clear threat of development and that the lands can be preserved over the long term.
- For all opportunities, determine whether the compensatory mitigation can be performed in a manner that generates benefits in an economically sound and reasonable manner, and can be maintained over the long term.
- Use the USACE definition (33 CFR 332.2) of “Practicable” in assessing options (“available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes”).

Donlin Gold followed USACE guidelines in considering the proximity of specific off-site opportunities to the impacted watershed, by first considering those within the middle Kuskokwim River watershed (HUC-08) and then expanding out concentrically, eventually extending to the entire Yukon-Kuskokwim (Y-K) region (HUC-06) and then, if needed, to other watersheds in Alaska. The Rule describes the general approach that permittees must follow in defining appropriate compensatory mitigation. In addition, as recognized by the 1994 AWI (EPA et.al. 1994), Alaska is unique because of its remoteness, lack of development, high percentage of wetland areas compared to the Contiguous United States and limited opportunities for off-site mitigation. The AWI and 2018 MOU acknowledge Alaska’s unique nature by encouraging flexibility in the levels and types of appropriate compensatory mitigation proposed.

Land ownership is a key consideration when assessing potential mitigation ventures. The USFWS, in partnership with the Great Land Trust, Alaska Department of Fish and Game (ADF&G) Division of Subsistence, and the University of Alaska Anchorage (UAA) Alaska Center for Conservation and Science produced a report on the Kuskokwim River watershed dated November 30, 2017 (Hults and Geist 2017). The report provides information relevant to an evaluation of the entire Kuskokwim River watershed. The watershed contains approximately 43.5 million acres of land. Figure 3, from the USFWS report, shows the general land ownership. The watershed land base is 83 percent State and Federal lands. The Federal lands under National Park Service (NPS) and USFWS management encompass 25 percent of the HUC-06 watershed. These lands are already protected for conservation under land plans established and managed by those agencies and do not require further protection. Land managed by the Bureau of Land Management (BLM) and the State (53 percent of the watershed) are not available for restoration and preservation as neither agency/entity has a mechanism to encumber the lands with the required long-term protection instruments. This applies to both preservation and any restoration opportunities. Hence, the only lands generally available in the watershed are private lands, which encompass less than about 17 percent of the watershed. Most of these lands are lands granted through ANCSA with the intent of being developed for revenue generation. An exception to this classification involves Federal and State mining claims that are inholdings located within a refuge or park system boundary which may present viable mitigation options.

Figure 3 Land Ownership in the Kuskokwim River Watershed (Hults and Geist 2017)

Another consideration for assessing mitigation options is to identify key areas of concern. This was a focus of the USFWS report, which identified significant habitat areas and threatened and endangered species areas within the watershed (see Figure 7 and Figure 8 in the report). None are located near the proposed Project wetland impact areas except for a single raptor nesting polygon near the Jungjuk (Angyaruaq) Port site. The report's primary focus was to use a compilation of ecological factors to rank areas on a 5-point scale from "Very High" to "Lowest" conservation value (see Figure 14 in the report, provided as Figure 4 below). The Project areas were scored "Lowest" in conservation value, except for the area immediately adjacent to Crooked Creek, which was scored as "Low." Areas further away from the Project in the HUC-06 watershed, i.e., generally closer to the coast, were ranked as "High" to "Very High" values by USFWS; coinciding with the Yukon-Delta and Togiak National Wildlife Refuges.

Figure 4 *Ecological and Conservation Values Scores (Hults and Geist 2017)*

Watershed Level Mitigation Projects

The most viable opportunities capable of generating off-site mitigation credits of the scale and impact types associated with the Project at a watershed level involve stream restoration and preservation in mineralized areas. Much of the watershed-level development in the Kuskokwim River region has been associated with historical and modern mining districts. To evaluate potential compensatory mitigation at the scale of the Project fill impacts, Donlin Gold considered options of restoring watersheds impacted by mining operations at the: (1) Platinum Mining District, (2) Tuluksak/Nyac Mining District, (3) Red Devil Mine Area, and (4) Kolmakof Mine Area. Donlin Gold also considered preserving the Fuller Creek watershed from future placer and hard rock mining activity.

In each of these areas, Donlin Gold considered the opportunity in terms of practicability for restoration/preservation, including availability, feasibility and cost, land ownership and long-term durability, and the potential for ecological enhancement/lift to wetland areas, streams, and riparian areas. Many other smaller, historical placer mining areas are located within the region, e.g., in the George and Holitna river drainages. However, these often involve small, single prospects where development is limited to small acreages and stream sections. Given their remote and scattered locations, any restoration work at these sites would be costly and complex, and unlikely to yield the watershed level of mitigation credits needed for the Project. Finally, there is virtually no threat of more extensive future development, and often no mechanism to impose a durable protective instrument (i.e.,

State or BLM lands). Smaller placer mines were, therefore, eliminated as viable compensatory mitigation options.

The Red Devil and Komerof mine areas are not practicable options for compensatory mitigation. The reasons are as follows:

- Red Devil is not practicable because it does not meet the overall purposes for compensatory mitigation through generation of wetland acres and stream miles. In addition, decisions on the final remedial action plan among BLM and the landowners³ is an ongoing process. BLM does not expect to finalize a work plan for site clean-up until 2019 or beyond. This also makes it unavailable for Donlin Gold.
- Komerof restoration work is largely complete. The Project, like Red Devil, does not meet the overall purposes for compensatory mitigation acres through generation of wetland acres and stream miles.

This left the Tuluksak/Nyac and Platinum districts, and Fuller Creek watershed for detailed consideration. Significant effort was expended in investigating each of these options and the results are described below.

Platinum Mining District

The Platinum site is located along the southwest coast of Alaska – south of the Kuskokwim River delta, approximately 240 miles from the Donlin Gold MA. Platinum is in the same HUC-06 watershed as the Project MA and TA. The site generally consists of the Salmon River watershed, which flows into Kuskokwim Bay. In July 2017, Donlin Gold staff observed an abundance of sockeye and coho salmon moving upstream in the Salmon River to spawn. Other salmon species have also been observed and the river and tributaries provide key areas for juvenile salmon rearing. The area further includes significant avian and Steller sea lion habitat in and around the Togiak National Wildlife Refuge (Refuge).

The Platinum site includes mined and unmined mineral claims on BLM lands. A portion of the unmined claims in the lower Salmon River watershed extend onto the Refuge. Placer mining for platinum in the Salmon River watershed began in the 1920s and has occurred at various times through 2011 when XS Platinum ceased the most recent operations. Approximately 645,000 ounces of platinum have been produced to date. The residuals from past placer mining (tailings and overburden) fill large areas of the Upper Salmon River watershed; rough estimates suggest millions of cubic yards of these residuals. The excavation, washing, and placement of these materials have significantly changed the hydrology of the drainages in and around the mined areas.

Donlin Gold investigated a combined preservation and restoration PRM plan in the Salmon River watershed within and below the areas where mining has taken place. Preservation would have included claims situated within and outside the Refuge. Restoration, located entirely outside the Refuge, would have primarily focused on re-establishing stream connectivity to improve access to salmon habitat

³ BLM is in the process of developing several options on how to address the concerns related to possible future contamination of the Kuskokwim River from this site.

throughout the drainage. Figure 5 depicts the Platinum area with conceptual plans where restoration and preservation could potentially occur, it also shows where potential future placer mining might be conducted. The total wetland acreage of the combined plan would have been approximately 1,800 acres. Donlin Gold proceeded to further investigate this option to determine the remainder of the practicability components.

The majority of the mining claims are currently owned by a private family business, Hansen Industries, Inc. (Hansen). Hansen's stated goal is to sell all its claims at Platinum. The recorder's office shows an interest in some of these claims that were originally held by Harry Shippey and have been passed along to several heirs. Angler Mining Pty, Ltd. (Angler) has an option agreement in place and currently controls the entire claim block. Hence, the property is under the control of an active claim owner and not readily available. Initial offers to purchase an interest in the claims at market value were rejected.

The residual placer mining materials have been placed in very large piles with steep side slopes (angle of repose) along the Salmon River drainages. To remove these materials and restore the topography and hydrology associated with wetlands would involve re-locating several million cubic yards of materials into non-wetland areas. For example, the current stream width is approximately 20 to 30 feet wide with no riparian zone. With the geometry of the washed rock spoil piles (see Photo 1), it would necessitate the removal of between 3,630 and 7,300 cubic yards to create 20 feet of riparian zones/wetlands per 100 feet of stream length. This would provide 0.046 acres of restored wetlands. The estimated cost to generate 1 acre of wetlands through removal of material down to the water table, placement of at least 1 foot of soil (if available), and re-vegetation would be in the range of \$640,000 to \$1 million per acre.

A key physical challenge to restoring wetlands in the mined areas is the groundwater table lowered as a result of the past mining activity. The dredge used for mining had a reach of up to 60 feet below the water level in which the dredge was working. The sluicing process removed all the fines from the material being processed and they were washed downstream and out to the coastal waters. This resulted in changes to the water table hydrogeology that cannot be physically restored. The diagram below (Figure 6) is a graphical representation of the hydrogeologic changes. As such, these areas have been converted to uplands. Re-grading the surrounding spoils back to the original contours would only eliminate the existing stream and not restore wetlands (see bottom image in Figure 6).

Figure 5 Platinum Mining Claims

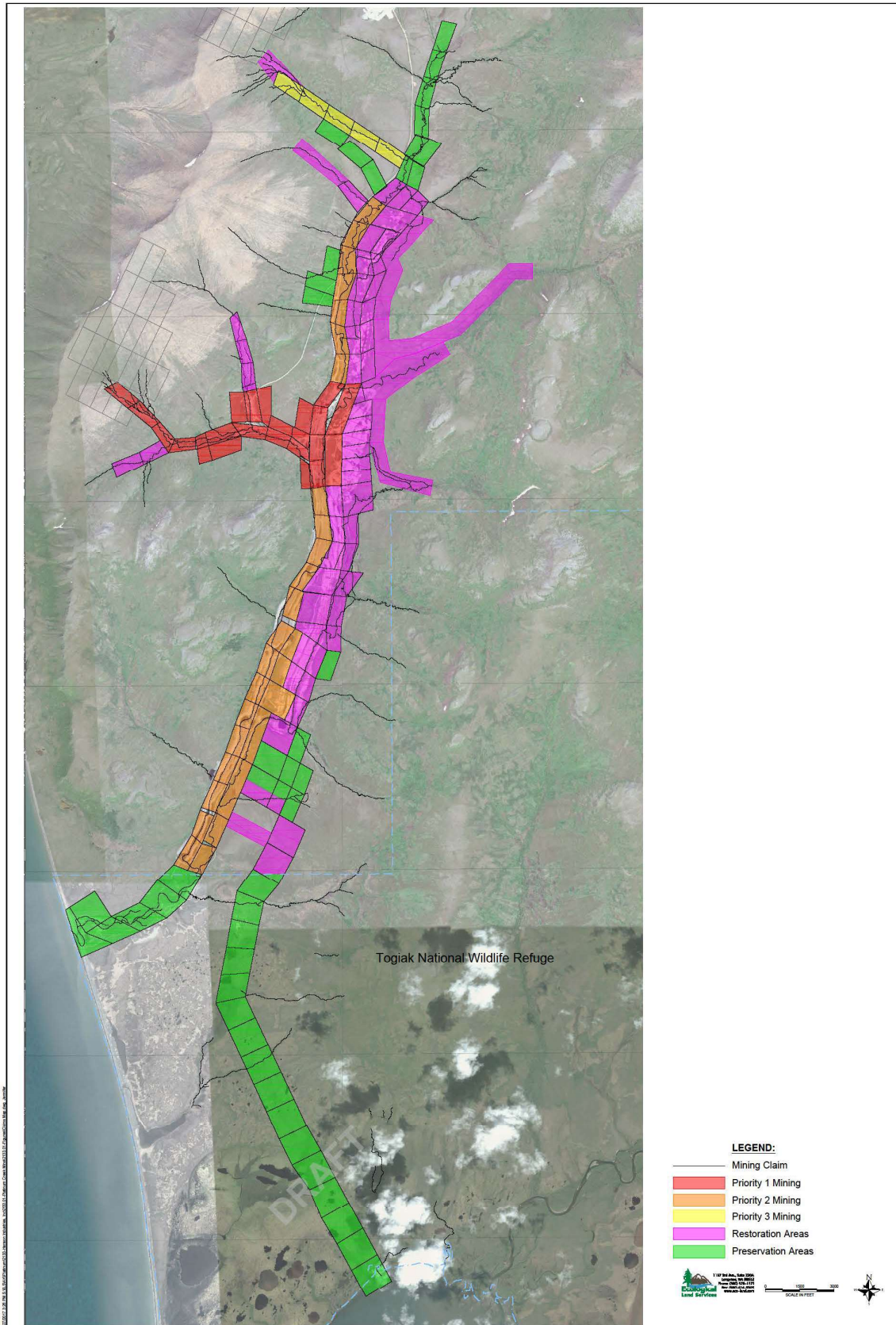
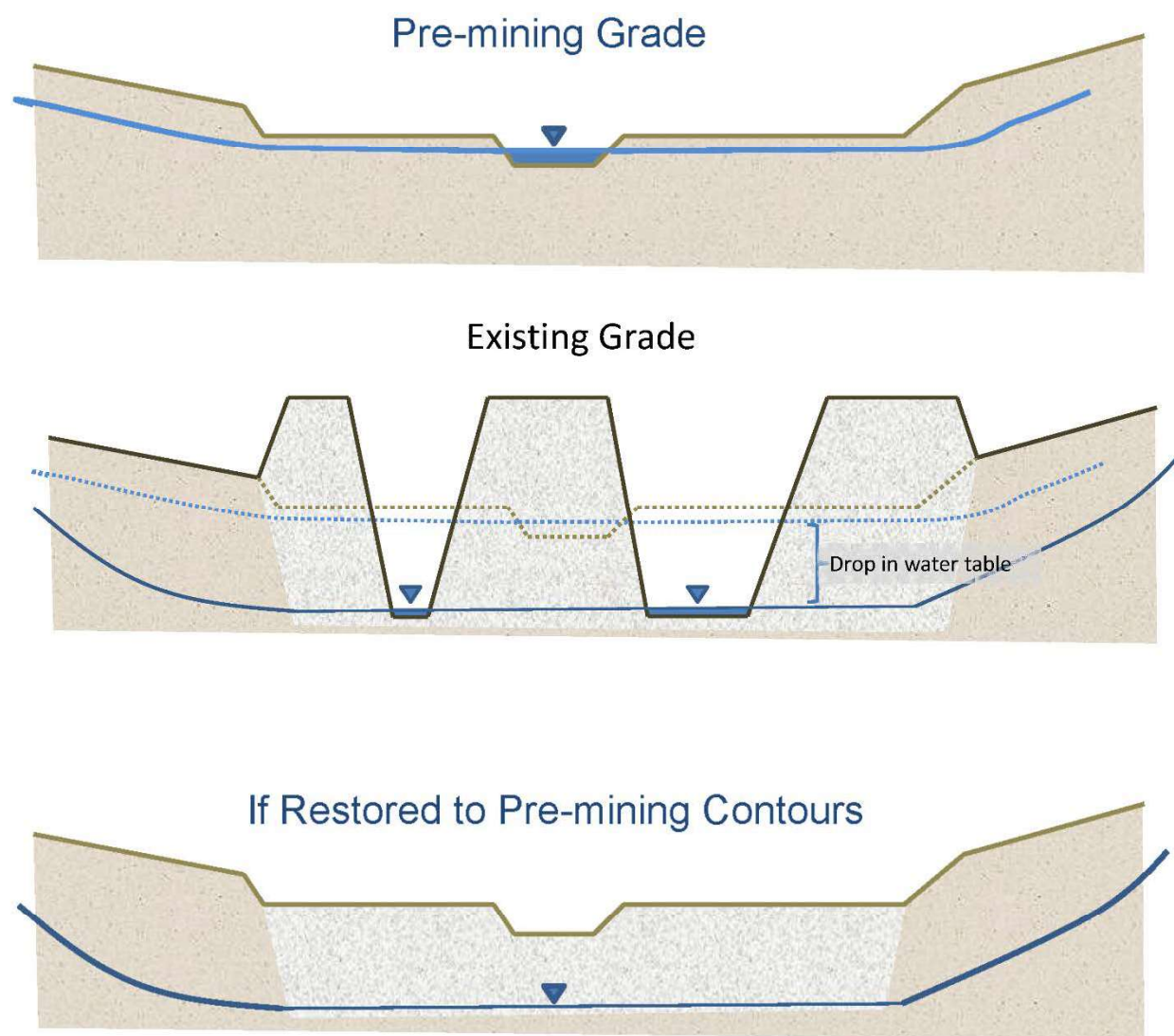


Photo 1 *Panorama of Spoil Piles at Platinum*



Figure 6 *Hydrogeologic Alterations at Platinum*



Logistically, two other issues affect practicability:

1. The excess material from the wetland creation discussed above would need to be stockpiled. Essentially all areas surrounding the previous mining activities are wetlands. If these materials are placed in the surrounding areas, then the creation of new wetlands would be offset by the filling of other wetlands. Alternatively, if the material is kept within the current disturbance footprint, then existing ponds in the surrounding valleys would be filled and the amount of wetland acres created would be substantially reduced.
2. To create wetlands, an estimated 1,600 cubic yards of soil would be needed for each acre of wetland to be established. In addition, BLM has stated that, if existing spoils are disturbed, the resulting reclamation would need to meet BLM's reclamation standards, which include at least 70 percent vegetative cover. This also would necessitate placement of soils over all reclaimed areas. Hence, to reclaim 1,000 acres as either wetlands or uplands would require 1.6 million cubic yards of soils. These quantities of soil do not exist at the site.

Based on availability, cost, technological, and logistical criteria, the results of this review show that restoration of wetlands in the previously mined areas at Platinum is not practicable to obtain compensatory mitigation credit.

With elimination of restoration as an alternative, potential preservation at Platinum consists of two parts: claims inside and outside the Refuge. For claims situated within the Refuge land control would revert to the USFWS upon claim abandonment. The Refuge claims comprise about 650 wetland acres and 200 additional upland buffer acres with high, watershed-level aquatic and avian habitat value. There is the potential threat of mineral development based on the valid existing rights in the mining claims, although to date no detailed mineral evaluation and mine planning has occurred with respect to these claims. These numbers fall well short of the target watershed-level acres sought for off-site compensatory mitigation credit by the Project. These claims also fail the availability requirement for the same reasons cited above.

Outside of the Refuge, BLM has expressed a desire to see the claims mined. Further, if Hansen and Angler agreed to relinquish their mining claims situated outside of the Refuge, Calista has a right to assume ownership. Considering the ANCSA mandate that lands selected for their mineral potential be developed for the benefit of Alaska Native shareholders, Calista may not be able to allow these lands to be preserved from development over the long-term. The complexity of the claim ownership and availability make it impractical to establish a preservation agreement for the unmined claims situated outside of the Refuge.

Based on all the above factors, the Platinum Mining District was eliminated as an off-site compensatory mitigation option.

Tuluksak/Nyac Mining District

The Tuluksak River watershed was selected as a potential compensatory mitigation opportunity based on its contributions to the Kuskokwim River salmon stock and its presently low production of Chinook and chum salmon returns. The Tuluksak River watershed is located within the lower Kuskokwim River

basin approximately 138 river miles upstream from the mouth of the Kuskokwim River. The Tuluksak River originates in the Kilbuck Mountains and flows approximately 86 miles through the Yukon Delta National Wildlife Refuge, entering the Kuskokwim River near the village of Tuluksak. The entire watershed is approximately 892 square miles and supports spawning populations of Chinook, chum, coho, and pink salmon. Resident species include Arctic grayling and Dolly Varden.

The Tuluksak/Nyac Mining District is known for its long history of mining activity dating back to 1907. Disturbance and stream alteration associated with more than a century of mining have resulted in decreased salmon production in the watershed, especially Chinook and chum salmon stocks. In September 2000, the Alaska Board of Fisheries identified Tuluksak River Chinook salmon within the “stocks of yield concern.” The designation was discontinued in 2007 after escapements returned to levels above the historical average. However, poor returns of Chinook salmon to the Tuluksak River since 2007 indicate it is still a stock of concern.

Existing dredge tailings and overburden are located throughout the historical Tuluksak River floodplain and form a circuitous maze of pools and low-flow waters. The high mounds of tailings and overburden left behind by dredge activity have forced the main Tuluksak River channel to the northern edge of the floodplain. Photo 2 shows the nature of the past mining activity and the current condition of the Tuluksak/Nyac site.

Photo 2 Tuluksak/Nyac Site



Donlin Gold investigated a restoration PRM plan in the Tuluksak River watershed within the areas where mining has occurred. Restoration would have primarily focused on increasing stream connectivity to the ponded areas to improve access to salmon habitat throughout the mined areas. The total wetland acreage of the combined projects would have been very small and primarily involved open water habitat. Despite this significant limitation, Donlin Gold further investigated the practicability of this option.

In the Tuluksak/Nyac District, the underlying claims are controlled by Calista. The placer mine operation is leased from Calista by Dr. J. Michael James/Nyac Gold, LLC, who assumed full management of the claims nearly 20 years ago after the death of his business partner. In recent years, Dr. James has continued mining activity in the district and has maintained the validity of his claims. Overall, Dr. James's total claim area comprises tens of thousands of acres. Because of the site control and active ownership status, securing the land for mitigation is difficult.

Donlin Gold conducted an evaluation of potential opportunities to conduct restoration work in the Tuluksak River watershed. Full-scale restoration of the river, riparian areas, and associated wetlands is not practicable given the nature of the disturbance, the lack of space available for tailings and overburden management to create wetlands from uplands, and the lack of soil available to support reclamation of the re-located materials. A key difference between the Platinum site, which has high spoil peaks and widely spaced valleys, and the Tuluksak/Nyac site is the wider, closer spaced valleys filled with ponds at Tuluksak/Nyac (see Photo 2). Creating wetlands from this configuration is physically and logistically problematic. There is very little working room for equipment, which would have to work along the narrow spoil ridges. There is no space readily available to dispose of the material if the goal is to create wetlands from the ridge areas. Re-grading the spoil ridges downward would fill the adjacent ponds, creating turbidity and reducing the open water habitat. The geometry is such that the grading could eliminate the ponds to achieve a material balance. This would eliminate the existing anadromous habitat – a detriment, not an improvement. As with Platinum, there is a lack of soil available to complete wetland creation. In addition, the spoils at Tuluksak/Nyac have re-vegetated and provided stable habitat. Therefore, creation of wetlands from the current configuration is not practicable based on logistics and available technology.

From a fisheries perspective, it would be more effective to focus on individual projects to improve stream hydrology, connectivity, and aquatic habitat from and within the existing network of ponds. Therefore, Donlin Gold identified specific projects that could benefit aquatic resources including: (1) targeted alterations of the main channel to approach the variety of geomorphology that supports a greater diversity of fish habitat; (2) the removal of fish passage barriers between the historical dredge pond maze and the main channel, thus opening up new fish spawning and rearing areas presently inaccessible from the mainstem of the Tuluksak River; and (3) removal of the partial fish passage barrier (culvert replacement) within Slate Creek, thereby opening all of Slate Creek to upstream spawning migration during all flow stages and providing free and unrestricted movement for rearing juvenile salmonids. Like Platinum, these projects would yield significant lift in the aquatic habitat but few, if any, wetland acre credits that are needed to meet the target mitigation needs. Therefore, while these projects would provide some desired environmental benefits, they do not accomplish restoration at a watershed level.

Donlin Gold's review determined this project is not practicable. The area is under active lease and not readily available. The Tuluksak/Nyac District mitigation option could result in tangible improvements in aquatic habitat and increased fish populations, but lacks potential to create significant wetland acre mitigation credits. Based on these factors, it was eliminated from further consideration as an off-site compensatory mitigation option.

Fuller Creek Parcel

Donlin Gold evaluated the permanent protection of a 10,873-acre parcel in the Fuller Creek watershed. The Fuller Creek parcel is in the middle Kuskokwim River watershed, approximately 0.5 miles south of the community of Red Devil, within the Vreeland Creek-Kuskokwim River HUC-10 watershed. The Vreeland Creek-Kuskokwim watershed is approximately 19 miles southeast from the Project MA, and is located within the same HUC-08 Aniak watershed as the MA and much of the TA.

The Fuller Creek parcel is large enough and contains sufficient wetlands (3,135 acres) and aquatic stream resources (50 stream miles) to offset the potential losses of aquatic resources associated with the Project. In addition, the parcel serves as a large buffer that further protects the Fuller Creek watershed and the physical, chemical, and biological functions of the parcel's wetlands and streams. The Fuller Creek parcel specifically includes 8 miles of coho salmon spawning and rearing stream reaches, supported by the physical, chemical, and biological functions of the adjacent wetlands. The presence of other anadromous species has not been documented in the Fuller Creek watershed.

The Fuller Creek placer prospect is located along Fuller Creek, about 3.1 miles south-southeast of the mouth of the creek. Placer gold deposits reportedly occur for about one mile in Fuller Creek, west of Barometer Mountain. Other mining prospects within the Fuller Creek parcel include McCally, Fairview, and an unnamed prospect southeast of Barometer Mountain. The bedrock geology of the area comprises shale and sandstone of the Upper Cretaceous, Kuskokwim Group, intruded by small Late Cretaceous to Early Tertiary mafic to felsic intrusions (Bundtzen and Miller 1997). This geology is quite similar to the geology of the Donlin Gold Project.

While mineral prospects exist in the Fuller Creek drainage, there is no indication that they will be developed in the foreseeable future (no current or pending leases or claims to demonstrate a threat of development). In western Alaska, placer deposits have generally been the most available sources of minerals due to their ready access in drainages and simple mineral recovery by relatively low-cost methods. Recently, development of new watershed-wide placer mine operations has been rare; instead the common practice is to mine existing placer areas where facilities and equipment are already in place. Within the Y-K region, placer mining activity in general has been declining. Development of the Fuller Creek deposits by placer mining would pose greater challenges than exist at other nearby areas that have been previously mined. Therefore, the threat of placer mining in the Fuller Creek parcel is considered very low in the foreseeable future.

As for hard rock mining opportunities, remote areas of Alaska present extraordinary challenges in developing mining projects. Deposits must be of the size and scale to support the excessive costs of developing and sustaining the infrastructure required to access, construct, operate, and close the projects. This often involves defining millions of ounces of resources at depths that typically extend hundreds and even thousands of feet below the ground surface. For example, serious advancement of this Project has been ongoing since 1989 with more than \$500 million already spent in exploration, design, and permitting costs. After six years of review under the National Environmental Policy Act, Donlin Gold has still not obtained the required permits that are necessary before it can make a construction decision. Moreover, Donlin Gold is recognized as one of the richest undeveloped, open pit gold deposits in the world. While having somewhat similar geology to Donlin Gold, there is no evidence

that Fuller Creek has comparable resources that could be mined. No detailed exploration work (e.g., drilling) has been conducted to characterize the hard rock mineral potential. As such, even if viable hard rock deposits are in the Fuller Creek parcel, they are realistically many decades away from potential development.

Because of the lack of existing placer mining activity in the Fuller Creek parcel and the fact that it is highly unlikely a large hard rock mine would be constructed in the foreseeable future, Donlin Gold considers the threat of development in the watershed to be very low.

As noted above, coho salmon are the only salmon species observed in the Fuller Creek drainage. While important, there is no evidence that there is a lack of coho salmon habitat within the Y-K Region. Specifically, preservation of the parcel would likely not yield any tangible benefits in terms of increased coho salmon populations in the Kuskokwim River. In addition, there is no evidence that subsistence use of coho salmon in any areas of the region is limited.

Finally, Donlin Gold entered into discussions with the interests that control the Fuller Creek parcel to ascertain its availability for preservation as compensatory mitigation. These interests had previously worked with the USACE to potentially establish a compensatory mitigation bank that would facilitate preservation of the Fuller Creek parcel specifically for the Project. Unfortunately, there were significant differences in the valuations placed on the Fuller Creek parcel by the various parties. The interests that control Fuller Creek asked for reimbursement several multiples in excess of the fair market value of lands and placer deposits in the region (generally \$500 to \$1,000 per acre). As a result, Donlin Gold determined it was impracticable to pursue preservation of the Fuller Creek parcel.

In summary, because of the low development threat in the reasonably foreseeable future, the documented presence of only coho salmon use, and the significantly above-fair-market-value requested for preservation, the Fuller Creek parcel was eliminated as an off-site mitigation option.

Other Mitigation Options Considered within the HUC-06

Many of the off-site options evaluated involve non-traditional mitigation opportunities, i.e., they do not directly include restoration or preservation of wetlands and streams. These included: (1) landfill and solid and hazardous waste management improvements, (2) community drinking water and sanitary system improvements, (3) erosion control along rivers and streams, (4) trail enhancements to minimize erosion, (5) reclamation of the Newtok Village site that is being re-located, and (6) invasive species control in the Crooked Creek watershed. These projects reflect specific environmental and human health needs in the Kuskokwim River watershed. While these projects can lead to indirect improvements in stream water quality and aquatic habitat, such results are not readily quantified into wetland acres or stream miles as required under the Rule. Therefore, they do not meet the overall Project need as it relates to compensatory mitigation. There generally is no quantitative method to describe how they would compensate for unavoidable Project impacts to aquatic habitat and fish in the watershed. Further, their long-term “performance” cannot be readily measured in terms of benefitting aquatic resources. Showing such measurable long-term performance is typically required to obtain compensatory mitigation credits for affected wetland acres and stream miles. Finally, there is essentially

no precedent for such non-traditional measures being accepted as compensatory mitigation in Alaska. The non-traditional compensatory mitigation options are therefore not included in the CMP.

Broader State-Wide Potential Mitigation

While it is typically not required, Donlin Gold continued to look beyond the HUC-06 watershed to determine if there were other areas or projects that may meet the general intent of the Rule, taking into consideration the flexibility provided by the 1994 AWI (EPA et.al. 1994). The following discussion addresses two projects Donlin Gold identified: (1) the Flat/Iditarod Mining District, a historical gold mining district in the Yukon River watershed, and (2) the Chuitna River watershed, which has a long history of coal, oil, gas, and timber activity, and is a highly productive salmon river in the populated Cook Inlet watershed.

Flat/Iditarod Mining District

The Flat/Iditarod Mining District is in the Flat Creek drainage. The area is approximately 40 miles north-northeast of the Donlin Gold MA, just over a ridge separating the drainage between the Yukon and Kuskokwim Rivers. Despite the proximity to the Project MA, Flat is outside the HUC-04 of the MA; it is located in the Lower Yukon River HUC-04. The Flat Creek area comprises thousands of acres of historically dredged/placer-mined streams and tributaries. The district is also of historical significance, and is part of the Iditarod Trail, although it is not included in the modern Iditarod Trail events and activities. The Flat area includes a functioning airstrip and some remnant roads which historically provided access to Iditarod and beyond.

The area is mostly situated in a parcel that was conveyed to Doyon Limited (Doyon) under ANCSA, although the mining rights remain under BLM control. BLM has expressed hope that restoration could be conducted on much of the area to facilitate full transfer to Doyon. It is not evident that the material needed, including topsoil, is available to complete reclamation. Much of the area is uplands. Several mining claims exist under private control, many held by the Miscovich family who were original residents and miners. Historical features are present throughout the landscape.

The Flat/Iditarod Mining District provides a large restoration area opportunity for compensatory mitigation. However, the complexity of the land issues makes it difficult to acquire all the claims and secure long-term durability. The comments related to reclamation of BLM lands at Platinum also apply to Flat. This includes the challenges associated with meeting current reclamation and revegetation standards and potential conflicts with ANCSA mandates. There are also significant and numerous historical features that would complicate efforts to perform large-scale reclamation of the area. Securing this area to conduct wetland restoration for wetland compensatory mitigation will require compliance with Section 106 of National Historic Preservation Act for potential impacts to cultural resources. Mitigation compliance costs are not typically determined until the end of the consultation process, which traditionally takes years to complete. This time constraint severely complicates logistics and planning. Therefore, the Flat/Iditarod Mining District was not considered further in this CMP.

Chuitna River Watershed

The Chuitna River watershed is a drainage located on the west side of Cook Inlet 45 air miles from Anchorage, the largest city in Alaska. This area has a unique mix of existing and potential future industrial activities that surround the Chuitna drainage. The area has two active ports – one at North

Foreland to the south, which includes a beach barge landing area and a pile supported trestle and dock; and a barge beach landing area to the north known as Grant's Landing. The ports have been used for the import of oil field pipe, equipment, fuel, and supplies for Tyonek and Beluga, two local communities. A series of connecting service trails and roads connect Tyonek and Beluga for local uses. Resource development roads are interspersed in the region to facilitate the harvest of timber, and for the development of the regional oil and gas industry. Temporary roads have been constructed for coal exploration and development. The Beluga coal field and the Beluga oil and gas basin are centered here. Gas from the region is collected and shipped to the Beluga natural gas power plant or into the regional gas supply system for distribution to Anchorage, the Matanuska-Susitna Borough, and the Kenai Peninsula for heating and power generation.

The Chuitna River area is used by Alaskans and non-residents for recreational and guided fishing. Offshore fisheries in Cook Inlet include salmon and halibut. The Chuitna River contains very productive salmon runs including Chinook salmon (listed as a species of concern by the ADF&G), coho, sockeye (minor use), chum, and pink salmon. These salmon provide an important food source for endangered Cook Inlet Beluga whales. While State and Federal permit programs strive to balance development with land, habitat, and wildlife protection, the proximity of the area to Anchorage places development and use pressures on the Chuitna River that merit special consideration for additional protection through preservation of portions of the watershed.

Donlin Gold entered into discussions with two of the key land owners in the watershed: the Tyonek Native Corporation (TNC), and the Trust Land Office (TLO), which manages lands for the Alaska Mental Health Lands Trust (AMHT) Authority. Both entities expressed an interest in preserving key critical habitat areas within the 95,000-acre Chuitna watershed while preserving their ability to generate revenues from the remaining lands in the area. Donlin Gold reached an agreement with both entities to obtain the preservation rights to nearly 6,000 acres of wetlands, highly productive salmon streams, and associated upland buffer areas.

Off-Site Options Conclusion

After conducting extensive review of all off-site mitigation options to supplement the reclamation and restoration of placer-mined areas in upper Crooked Creek and the post-mining restoration of wetlands in the MA, Donlin Gold proposes to preserve lands within the Chuitna watershed as a PRM Plan for the Project. The PRM Plan for the Chuitna Preservation Area (Preservation Area) is provided in Attachment E. Selection of these lands for preservation is based on:

- The ability to preserve extensive wetland acres and stream miles providing compensatory mitigation for the permanent and long-term fill impacts in the MA, TA, and PA. This includes several tributaries including headwaters, and much of the mainstem of the Chuitna River to the estuarine water of Cook Inlet. The proposed Preservation Area will set aside 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of WOUS. It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. The 2,183 acres of upland riparian and buffers, and 418 acres of stream serve a critical role in maintaining the watershed-level functions and values of the preserved wetlands.

- The watershed provides important spawning and rearing habitat for all five Pacific salmon species as well as having large populations of resident fish species. While not in the same HUC-10 as the MA and TA, the linear length of important salmon habitat in the Preservation Area is 36 times more than the areas that would be filled in the Crooked Creek watershed. As discussed in the Chuitna PRM Plan (Attachment E), observed salmon populations are much higher in the Chuitna watershed compared to Project drainages. The Chuitna watershed also overlaps with the critical habitat for endangered Beluga whales and salmon provide an important food source for these whales.
- There is a recent threat of development associated with coal resources throughout the watershed. The extent and potential value of the coal deposits are well-established and detailed mine plans have been advanced, including significant work to permit these deposits. In addition to the threat of coal mining, oil and gas development activities, timber harvest, and gravel extraction operations exist throughout the watershed with a long history of development of these in the area (see Attachment E for an expanded discussion of the development threats).
- Donlin Gold has reached agreements to establish secure, durable deed restrictions for the proposed mitigation areas.

Table 4 Compensatory Mitigation Options Evaluated by Donlin Gold

Mitigation Option	Description	Rationale for Elimination
<u>Banks and ILF Programs</u>		
Conservation Fund State-wide ILF Program	Instrument intended to provide mitigation credits for projects throughout Alaska.	No longer offering credits in Alaska per the USACE decision to terminate the program in October 2017.
Great Land Trust ILF Program	Instrument intended to provide mitigation credits for projects throughout Alaska, although primarily focused on the Anchorage area. Credits are currently available only for wetland impacts in the Matanuska-Susitna service area.	The service area for available credits is currently limited to the Matanuska-Susitna Borough. Hence, the Program cannot provide compensatory mitigation for most of the permanent Project impacts. However, Donlin Gold has made a commitment to purchase credits for the 5.0 acres of permanent PA impacts within the GLT service area.
State of Alaska ILF Program	Planned to provide credits associated with State lands.	In early stages of development; no guarantee credits will be available to Donlin Gold.
Su-Knik Bank	Offers compensatory mitigation credits associated with high-value preservation areas in the Matanuska-Susitna Borough. As of May 2018, the Bank had 1,700 credits available for purchase.	All but 5 acres of the permanent Project impacts to wetlands are outside of the Bank's primary and secondary service areas. Donlin Gold solicited a competitive bid offer from the Bank to provide credits for the PA impacts in their service areas. As a result of that process, Donlin Gold chose to secure the necessary credits from Great Land Trust, who has an overlapping service area with Su-Knik Bank..
<u>Village Site Restoration</u>		

Mitigation Option	Description	Rationale for Elimination
Newtok Village Reclamation and Remediation	Donlin Gold reached out to USFWS to identify potential mitigation opportunities. USFWS expressed interest in the Newtok Village reclamation and restoration. The village is located 94 miles north of Bethel at the confluence of the Ninglick and Newtok Rivers. Severe erosion along the Ninglick River is threatening the village and it is being relocated. Continued erosion could destroy the village, with infrastructure potentially slumping into the river creating waterborne hazards. Beyond erosion are threats of contamination associated within an old armory, Bureau of Indian Affairs school, landfill and waste storage areas, tank farms, other tanks, a generator facility, and other community and commercial facilities. The school and armory are on the State's Contaminated Sites List.	While many of the Newtok facilities with potential contamination risk have been inventoried, detailed investigations and clean-up plans have not been developed or approved by State and Federal agencies. Given the number and extent of the sources and expectation of compliance with stringent state clean-up standards, remediation could take many years and costs are currently impossible to quantify due to the many unknowns. There is also the potential for significant long-term liability. The USFWS Hazardous Materials Inventory for the village acknowledges the most significant data gap is the extent of contaminated soil, ground and surface water. In addition, remediation activities likely have limited potential for wetlands restoration and thereby would not generate substantive wetland and stream mitigation credit. As a result, Newtok Village reclamation and remediation is not a practicable compensatory mitigation alternative for Donlin Gold.

Mitigation Option	Description	Rationale for Elimination
<u>Mining/Mineral Development Area Restoration and Preservation</u>		
Flat/Iditarod Mining District Restoration	Gold was discovered in Flat in 1908, and the subsequent influx of miners and businesses created a town of about 6,000 by 1914. The area surrounding Flat Creek/Otter Creek in the Yukon River watershed has been thoroughly mined by placer activity, and miles of disturbed streams and un-reclaimed overburden/tailings dominate the landscape. The land is managed by BLM, which administers the various claims/leases in the area.	Multiple claim and lease holders made the likelihood of successfully negotiating required agreements low. Also, all restoration would likely have to meet current BLM reclamation standards, which is impracticable given the scale of the deposited material, availability of segregated soil to support re-vegetation, and changes to the baseline hydrology in the watershed. There would also be significant issues in protecting cultural resources in the District related to the historical mining activity and the Iditarod Trail.
Tuluksak/Nyac Mining District Restoration	The Nyac Mine is located on the Tuluksak River and its tributaries about 60 miles east/northeast of Bethel. The underlying claims and some of the land areas are controlled by Calista. The placer mine operation is leased from Calista by Dr. J. Michael James (Nyac Gold, LLC), who assumed full management of the claims nearly 20 years ago.	Because of its location in the Kuskokwim River watershed, Donlin Gold evaluated Nyac Mine restoration in detail. In the mined and other impacted areas, existing natural processes have resulted in restoration of stream and aquatic habitat. Salmon are present in the stream system and restoration activities may pose a risk to them. The volumes and arrangements of tailings and overburden left by the dredge activities make restoration of wetlands while protecting salmon impracticable. Opportunities for watershed-level ecological lift from restoration work are therefore limited.
Red Devil Mine Remediation	The Red Devil cinnabar/mercury mine is an abandoned historical mine on land managed by the BLM. The site is a very high-profile remediation/clean-up project; BLM has proposed a range of remedial actions to restore and protect Red Devil Creek and the Kuskokwim River.	Because of its location in the middle Kuskokwim River watershed, Donlin Gold evaluated Red Devil Mine remediation in detail. While the BLM has proposed specific remedial plans, there is disagreement on the scope among the EPA, the State of Alaska, and TKC, the landowner. These issues are likely to continue for years. Until a final resolution is agreed upon, it is unclear how Donlin Gold could contribute to restoration activities. In addition, the property does not lend itself to restoration and preservation of a significant amount of wetland acres as needed for the Project purpose. This makes Red Devil impracticable as a mitigation option.

Mitigation Option	Description	Rationale for Elimination
Kolmakof Mine Site Remediation	The Kolmakof Mine is a historical cinnabar/mercury mine east of Aniak on the north shore of the Kuskokwim River. The last known production was in 1970. The site has been substantially cleaned up and most contaminants removed in a coordinated effort between EPA and BLM. Some mercury/contaminated soils are still on-site and plans are in place to remove them.	The site is relevant because of its location in the middle Kuskokwim watershed. However, because clean-up has generally been completed at the site, there is little or no opportunity for additional restoration to create ecological lift and associated mitigation credit.
Platinum Mining District Restoration and Preservation	The Platinum Mine site is just south of Goodnews Bay, on Kuskokwim Bay, west of Bristol Bay on the Bering Sea. The mine site comprises nearly 200 BLM claims totaling just over 4,000 acres. Placer mining has occurred in the watershed since the 1930s, with the most recent mining in 2008. Extensive placer tailings and overburden are found in the watershed and the hydrology has been altered. Approximately 800 acres of largely undisturbed claims are situated within the Refuge. Angler has entered into an agreement with the current lease holder, Hansen, to access the claims and conduct additional placer mining.	Because of its potential for significant watershed-level restoration and preservation of important anadromous fish and avian habitat, Donlin Gold evaluated Platinum in detail. The restoration of the area has the potential to restore hydraulic connections and thereby enhance fish passage and habitat. However, with the large volumes of deposited tailings and overburden and the disturbance to the subsurface hydrology from large-scale dredge activity, restoration of wetlands is not generally practicable. It is unclear how mitigation credit would be acquired as it relates to acres of wetlands. Also, discussions with BLM suggest the mined material would have to meet current mine reclamation standards, such as 70 percent revegetation success. This is not practicable given the types of materials and how the bucket-line dredge materials were deposited. Restoration was judged to not be practicable. For undisturbed lands in the lower areas of the Salmon River drainage outside the Refuge, underlying, long-term land control issues (minimum three-party involvement) make preservation of these areas impracticable. Donlin Gold actively pursued preservation of the approximately 850 acres (650 wetland acres) in the Refuge. If the mining claims were relinquished, control would revert to the USFWS (for long-term preservation). Donlin Gold approached the owners to acquire this property, but these efforts were unsuccessful.

Mitigation Option	Description	Rationale for Elimination
Fuller Creek Watershed Preservation	The Fuller Creek watershed is approximately 20 miles upriver from the Crooked Creek/Kuskokwim River confluence in the same HUC-08 as the Donlin Gold MA. The USACE previously recognized the mineral development threat in the Fuller Creek watershed; although only limited prospecting has occurred to date. Fuller Creek is listed in the state's Anadromous Waters Catalog for coho salmon, including supporting juvenile rearing. The presence of other aquatic species has not been documented. The lands are owned by Calista.	Because of the potential for preservation of anadromous fish habitat, the potential for watershed-level development, and proximity to the MA and TA, Donlin Gold evaluated Fuller Creek preservation in detail. Wetlands encompass approximately 3,000 acres within the approximate 10,000-acre watershed. Donlin Gold approached the partners that hold the rights to the parcel (Calista and Earthbalance Corporation) but were unable to reach an agreement that would make this option practicable. In addition, the actual threat of placer or hard rock mining development in the foreseeable future is very low.
<u>Non-traditional Mitigation Projects</u>		
Community Water and Wastewater System Improvements in the Y-K Region	Many communities in the Y-K Region, including the City of Bethel, have inadequate systems to provide safe drinking water and sanitary wastewater treatment. This presents both human health and environmental risks. In numerous cases, designs for improved systems are in place; however, they have not been implemented due to limited funding. Donlin Gold spoke to communities and the Yukon-Kuskokwim Health Corporation about opportunities to support such programs and gain compensatory mitigation credit.	Because these programs are non-traditional for compensatory mitigation, the benefits are not easy to quantify in terms of benefits to wetland acres or stream miles. Further, performance metrics are not readily quantified, and success cannot easily be demonstrated. There is essentially no precedent for acceptance of these measures for compensatory mitigation for large projects in Alaska. Therefore, they cannot reliably be shown to be able to provide the mitigation credits necessary for the Project.
Solid and Hazardous Waste Management	Many communities in the Y-K Region have landfills that do not meet minimum design standards. In addition, communities often have no viable and affordable options for management of hazardous materials and wastes. Both conditions pose significant risks to human health and the environment, including impacts to wetlands and streams.	Donlin Gold contacted communities about potential support for landfill improvements. In addition, Donlin Gold investigated options to facilitate backhaul of used hazardous materials and wastes to appropriate disposal facilities. For the reasons cited for community water and wastewater system improvements, these non-traditional options cannot be reliably shown to provide the mitigation credits necessary for the Project.

Mitigation Option	Description	Rationale for Elimination
Erosion Control Projects in the Kuskokwim River Watershed	Natural and man-made erosion is widespread throughout the Kuskokwim River watershed. Such erosion affects hydrology and water quality as well as aquatic resources. Erosion in some areas threatens villages. USACE completed a conceptual study of potential erosion control projects in the watershed. (This assessment was not done specific to the Project, but rather involved USACE's mission related to navigable waterways).	Donlin Gold considered options to support erosion control projects. However, it is difficult to provide permanent erosion control in dynamic stream systems like the Kuskokwim River. Designs can be complicated, materials availability scarce, and the projects would require ongoing maintenance to be effective. As indicated, the USACE study was conceptual and did not include specific designs, costs, and expected performance. For the reasons cited for community water and wastewater system improvements, this non-traditional option cannot reliably be shown to provide the mitigation credits necessary for the Project.
All-terrain Vehicle (ATV) Trail Hardening Projects in the Y-K Region	Environmental impacts associated with the degradation of ATV trails have become a serious concern in many locations in Alaska, including in the Y-K Region. Where ATV trails cross wetlands, alpine areas, steep slopes, and other areas with sensitive soil conditions, trails can become mucky, rutted, and eroded. Environmental problems associated with ATV trail damage include removal of vegetation, disruption and compaction of the soil surface, and alterations to site hydrology.	While there is a broad need in the region to protect wetlands and riparian systems from degradation due to ATV traffic, likely benefits are difficult to predict and performance cannot be readily measured. For the reasons cited for community water and wastewater system improvements, this non-traditional option cannot reliably be shown to provide the specific mitigation credits necessary for the Project.
Non-native Species Plant Removal in the Crooked Creek Watershed	Non-native species have the potential to adversely impact watershed function. Donlin Gold conducted a reconnaissance survey and found a minimum of 123.6 acres of land in the Crooked Creek watershed near the MA colonized by non-native species.	While valuable ecologically, it is not possible to quantify how removal of invasive species would provide restoration or enhance wetland acres or streams. As a result, potential mitigation credits cannot be determined, and performance could not be readily measured. For the reasons cited for community water and wastewater system improvements, this non-traditional option cannot reliably be shown to provide the specific mitigation credits necessary for the Project.

6.0 Compensatory Mitigation

Donlin Gold proposes two PRM Plans and a limited purchase of mitigation bank credits to offset the Project permanent fill impacts. They are:

1. The Upper Crooked Creek PRM Plan (Attachment D) includes the enhancement, reestablishment, restoration, rehabilitation and preservation of wetlands, riparian areas, stream channels, and uplands within 221.5 acres. The PRM Plan will restore degraded acreage in Quartz, Snow, Ruby and Queen Gulches, and at the Wash Plant Tailings Area. The PRM Plan will restore 95.7 acres of degraded floodplains into 93.0 acres of wetlands and 2.7 acres of riverine channel. A total of 8,892 liner feet of stream will be enhanced and reestablished by the work in the floodplain. Within the wetland floodplains. This PRM will be initiated concurrent with the start of MA construction.
2. The Chuitna PRM Plan (Attachment E) will preserve 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of WOUS. It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. A deed restriction and Long-Term Management Plan will be in place prior to the start of Project construction.
3. Prior to initiating Project construction, Donlin Gold will complete the purchase 9.80 wetland mitigation credits from Great Land Trust's mitigation bank for the permanent impacts from the PA in the Program's service area.

HGM and Cowardin classification systems were specifically used to calculate the acres of wetlands and linear feet for PRM stream restoration and preservation areas.

Summary of the Upper Crooked Creek PRM Plan

The Upper Crooked Creek PRM Plan was selected to provide compensatory mitigation for the Project from a wide range of potential PRM options identified across the Lower Kuskokwim watershed and throughout western Alaska. The PRM Plan includes the enhancement, reestablishment, restoration, rehabilitation and preservation of wetlands, riparian areas and uplands within 221.5 acres. The PRM plan will restore degraded wetlands and floodplains in Quartz, Snow, Ruby and Queen Gulches, and at the Wash Plant Tailings Area, Table 5.

Table 5 Upper Crooked Creek PRM Plan Areas Protected under the Site Protection Instrument (Acres)

Restoration Area	Acres
Quartz Gulch	45.2
Snow Gulch	36.7
Wash Plant Tailings Area	29.3
Ruby and Queen Gulches	110.3
Total	221.5

The PRM Plan will restore 95.7 acres of floodplains into 93 acres of wetlands and 2.75 acres of riverine channel. A total of 8,892 liner feet of stream will be enhanced and reestablished by the restoration work in the floodplains. Within the wetland floodplains, 15.2 acres of off-channel ponds will be improved as

aquatic resource habitat. In addition, there will be 16.8 acres of adjacent upland terrestrial habitat enhanced. A total of 109 acres of riparian upland and wetland buffers will be preserved around the restored and enhanced wetlands and stream channels. The riparian upland and wetland buffers are designed to maintain the long-term viability of the proposed restoration. This plan will be initiated concurrent with the start of MA construction. Table 6 summarizes the Upper Crooked Creek PRM Plan.

Table 6 *Acres and Linear Feet of Resources Re-established, Enhanced, and Protected by the Upper Crooked Creek PRM*

	Quartz Gulch	Snow Gulch	Wash Plant Tailings Area	Ruby and Queen Gulches	Total
Re-establishment of Stream Channel to Pre-mining Conditions (Linear Feet)	1,630	4,421	N/A	2,931	8,982
Re-establishment of Floodplain Habitat (Acres)	13.1	21.9	11.4	49.3	95.7
Enhancement of Off-channel Pond Habitat (Acres)*	N/A	2.7*	0.5*	12.0*	15.2*
Enhancement of Terrestrial Habitat (Acres)	2.5	3.4	2.4	8.5	16.8
Protection of Buffer Areas (Acres)	29.5	11.4	15.6	52.5	109.0
Total Protected under Site Protection Instrument (Acres)	45.2	36.7	29.3	110.3	221.5

*Acreage of enhanced off-channel pond habitat is included within the re-established floodplain habitat.

N/A: Not Applicable.

Note: Inconsistencies in sums are due to rounding.

Mitigation credits can include both wetlands and buffers. “District engineers may require the restoration, establishment, enhancement, and preservation, as well as the maintenance, of riparian areas and/or buffers around aquatic resources where necessary to ensure the long-term viability of those resources. Buffers may also provide habitat or corridors necessary for the ecological functioning of aquatic resources. If buffers are required by the district engineer as part of the compensatory mitigation project, compensatory mitigation credit will be provided for those buffers.” [33 CFR 332.3(h)(2)(i)].

As shown in (Table 7), The Upper Crooked Creek PRM was divided by wetland HGM types using Cowardin Classifications for both the restoration and preservation areas. The wetlands restored will be riverine. The wetlands within the preservation buffer areas include depressional, flat, riverine anadromous, and slope wetlands.

Table 7 Compensatory Mitigation Proposed for Upper Crooked Creek by HGM Class and Cowardin Group (Acres)

	Classification	Upper Crooked Creek Restoration	Upper Crooked Creek Preservation
Wetland HGM (Cowardin Classes)	Depressional (PAB, PEM, PFO, PSS, PUB)	0	1.6
	Estuarine Fringe (E2EM, E2US)	0	0
	Flat (PEM, PFO, PSS)	0	32.7
	Riverine Non-Anadromous (PEM, PFO, PSS, PUB)	93.0	0
	Riverine Anadromous (PEM, PFO, PSS, PUB)	0	18
	Slope (PEM, PFO, PSS)	0	11.6
	Totals		
	Wetlands and Ponds	93.0	63.8
	Stream and River Area	2.75	0.9
	Upland Riparian and Buffers	16.8	44.1
	Sub-Totals	112.5	109
	Total Area	221.5	

Summary of the Chuitna PRM Plan

The Preservation Area in the Chuitna PRM Plan (Attachment E) will preserve 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of WOUS. It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. The wetland systems within the Preservation Area include large areas of slope HGM wetlands including ericaceous shrub bog-string bog wetlands, riverine HGM riparian wetlands adjacent to anadromous streams, estuarine fringe HGM wetlands, and a small number of depressional HGM wetlands. Ericaceous shrub bog-string bog wetlands, a type of slope HGM wetlands, are a unique wetland type to the area, and only occur in a few very specific places worldwide.

Table 8 *Preservation Area Resource Types (Acres)*

Resource Type	Acres
Wetlands and Ponds	3,269
Stream and River Area	418
Upland Riparian and Buffers	2,183
Total	5,870

Source: Field Verified Mapping, Michael Baker 2017

Uplands and wetlands in the Preservation Area surrounding the Chuitna River and its tributary, Lone Creek, were selected to maximize the protection of wetlands, floodplains, anadromous streams, and riparian areas using a watershed approach. The Chuitna River floodplain includes back water sloughs,

ponds, minor channels, riverine wetlands, and scrub and forested uplands in the bends of the river. The preservation boundaries on the mainstem of the Chuitna River were selected to maximize full protection of the floodplain flow channels, which support the anadromous stream system. This protection provides a diversity of habitat, vegetation types, and terrestrial and aquatic resources within uplands and wetlands while protecting anadromous waters.

The boundaries around Lone Creek were established to maximize the amount of unique ericaceous shrub bog-string bog wetlands. This created a large contiguous undeveloped parcel of the stream and its tributaries and wetlands interspersed with uplands. This unfragmented parcel in the lower Lone Creek watershed protects the wetlands, baseflow, streams, and anadromous fisheries of both Lone Creek and the Chuitna River from development.

Table 9 shows a comparison of the Preservation Area HGM wetlands preserved and MA/TA wetlands permanently filled.

Table 9 HGM Class Wetlands Comparison: Preservation Area and MA/TA (Acres)

HGM Class	Preservation Area Preserved Acres	MA/TA ¹ Permanent Fill Acres
Depressional	79	3
Estuarine Fringe	29	0
Flat	0	1,623
Riverine	500	160
Slope	2,661	888
Total	3,269	2,676

*Inconsistencies are due to rounding.

Notes: ¹DA (Donlin Gold 2017)

Compared to the MA/TA's low-flow streams and small associated floodplains, the Preservation Area preserves over four times the riverine HGM floodplains; these floodplains help support the salmon fisheries of the Chuitna River. Also associated with the wetland floodplains are 2,183 acres of adjacent riparian uplands included in the Preservation Area.

The streams and rivers in the Preservation Area provide habitat for Chinook, coho, chum, and pink salmon, as well as limited habitat for sockeye salmon, Dolly Varden, and rainbow trout. The mainstem of the Chuitna River includes Chinook, coho, chum, and pink salmon spawning habitat, and rearing habitat for all five Pacific salmon species. Tributaries to the Chuitna River that fall within the Preservation Area also have documented use by all five Pacific salmon species. The Chuitna River and Lone Creek, both anadromous streams, have 424 acres of associated riverine HGM floodplains as shown in (Table 10) while the MA and TA have 7.8 acres. Only 76 acres of riverine HGM wetlands in the Preservation Area are not associated with anadromous streams compared to 152.2 acres in the MA and TA.

Table 10 *Riverine HGM Class Wetlands Comparison: Preservation Area and MA/TA (Acres)*

HGM Class	Preservation Area ¹ Preserved Acres	MA/TA Permanent Fill Acres
Riverine, Anadromous	424	7.8
Riverine, Non-Anadromous	76	152.2
Total	500	160

¹Inconsistencies are due to rounding.

Source: See Attachment E

Table 11 summarizes the anadromous stream habitat preserved in the Chuitna River drainage and permanently filled in the Crooked Creek drainage.

Table 11 *Summary of Anadromous Stream Habitat: Chuitna River Drainage Preserved and Crooked Creek Drainage Permanent Fill (Linear Feet)*

Species	Spawning		Rearing		Total Anadromous Habitat	
	Chuitna River Drainage	Crooked Creek Drainage	Chuitna River Drainage	Crooked Creek Drainage	Chuitna River Drainage	Crooked Creek Drainage
	Habitat Preserved	Habitat Permanent Fill	Habitat Preserved	Habitat Permanent Fill ¹	Habitat Preserved	Habitat Permanent Fill ¹
	Linear Feet (miles)		Linear Feet (miles)		Linear Feet (miles)	
Chinook	77,616 (14.7)	0	133,214 (25.23)	0	133,214 (25.23)	0
Sockeye	0	0	101,006 (19.13)	0	133,214 (25.23)	0
Coho	70,541 (13.36)	0	148,632 (28.15)	2,218 (0.4)	148,632 (28.15)	2,218 (0.4)
Chum	44,088 (8.35)	0	12,514 (2.37)	0	131,789 (24.96)	0
Pink	106,128 (20.1)	0	13,253 (2.51)	0	133,214 (25.23)	0

*Inconsistencies are due to rounding.

Source: See Attachment E

On October 22, 2008, the NMFS listed the Distinct Population Segment of Beluga whale found in Cook Inlet as endangered under the Endangered Species Act of 1973, as amended (ESA). On April 11, 2011, NMFS designated critical habitat for the Cook Inlet Beluga whale under the ESA. Two areas were designated as critical habitat; both comprising 3,016 square miles of marine and estuarine environments considered essential for the whales' survival and recovery. The Preservation Area includes approximately 29 acres of estuarine fringe HGM wetlands at the mouth of the Chuitna River that overlap with critical habitat for Cook Inlet Beluga whales.

Summary of Proposed PRM Plans

Table 12 provides a summary of the linear feet of permanent stream loss from the Project compared to linear feet restored and preserved by the PRM Plans. With these PRM Plans, the overall linear feet of stream restored and preserved exceeds Project losses; there is a net gain of 93,085 linear feet (17.6 miles) of streams. The Project impacts predominantly non-anadromous streams in the MA and replaces this loss with restoration and preservation of anadromous stream. There is specifically a net gain of 194,074 linear feet (36.8 miles) of anadromous stream gains. Polylines were used to calculate the stream lengths. During the digital mapping process, all visible wetland, waters, and vegetation boundaries are delineated as polygons (mapped as an area) and classified as uplands, wetlands, ponds,

or streams. All streams are delineated as polylines (mapped as a linear feature). Stream impacts and credits have been calculated from the polylines in linear feet.

Table 12 *Permanent Fill in Streams Compared to Restored and Preserved Stream Lengths, by Linear Feet (Miles)*

HGM Class Stream Channel	Cowardin Group	MA and TA Permanent Fill in Streams	Upper Crooked Creek PRM Restored	Chuitna PRM Preserved	Total Restored and Preserved	Net
Linear Feet (Miles)						
Anadromous	Intermittent	0	0	161 (0.0)	161	161 (0.0) gain
	Perennial	-2,218 (0.4)	0	196,131 (37.1)	196,131 (37.1)	193,913 (36.7) gain
Total Anadromous		-2,218 (0.4)	0	196,292 (37.2)	196,292 (37.1)	194,074 (36.8) gain
Non- Anadromous	Intermittent	-38,675 (7.3)	0	6,615 (1.3)	6,615	32,060 (6.0) loss
	Perennial	-133,060 (25.2)	8,982 (1.7) ¹	55,149 (10.4)	64,131	68,929 (13.1) loss
Total Non-Anadromous		-171,735 (32.9)	8,982 (1.7)	61,764 (11.7)	70,746	100,989 (19.1) loss
Total		-173,953 (32.9)	8,982 (1.7)	258,056 (48.8)	267,038	93,085 (17.6) gain

*Inconsistencies are due to rounding.

¹ In Upper Crook Creek: anadromous fish use is expected in the restoration areas. However, the exact stream lengths that will provide for anadromous fish habitat cannot be accurately predicted. Post-restoration monitoring will verify presence or absence of anadromous and resident fish.

Table 13 shows wetland HGM classes and the Cowardin groups comparing permanent Project wetland losses to the gains from the two PRM Plans. Wetland and pond polygons from the mapping were used to calculate wetland and pond acres, while upland riparian buffers and stream polygons were mapped, and acres calculated separately. There are no upland riparian buffers or stream acreages included within Table 13. Table 13 is comparing wetlands and ponds. The major gains from the PRM Plans are in slope (1,737.6 acres) and riverine anadromous wetlands (434.9 acres). There is a loss of flat wetlands (1,742.3 acres). There is a net gain of 550 acres of all wetland classifications from the implementation of the PRM Plans.

Table 13 Compensatory Mitigation Proposed by PRM Plan for Wetlands by HGM Class and Cowardin Group (Acres)

Wetland HGM (Cowardin Classes)	Classification	Chuitna Preservation Area	Upper Crooked Creek		MA/PA loss	Net Loss or Gain
			Restoration	Preservation		
Depressional (PAB, PEM, PFO, PSS, PUB)		79	0	1.6	3	77.6 (gain)
Estuarine Fringe (E2EM, E2US)		29	0	0	0	29 (gain)
Flat (PEM, PFO, PSS)		0	0	32.7	1,775	1,742.3 (loss)
Riverine Non-Anadromous (PEM, PFO, PSS, PUB)		76	93.0	0	156	13 (gain)
Riverine Anadromous (PEM, PFO, PSS, PUB)		424	0	17.9 ¹	7	434.9 (gain)
Slope (PEM, PFO, PSS)		2,661	0	11.6	935	1,737.6 (gain)
Totals	Wetlands and Ponds	3,269	93.0	63.8	2,876	550.75 (gain)

¹Riverine wetlands are adjacent to Crooked Creek.

*Inconsistencies are due to rounding.

7.0 Crooked Creek Watershed Analysis

Introduction

Regulations addressing wetland mitigation [33 CFR 332.3(c) and 40 CFR 230.93(c)] direct the district engineer to use a watershed approach to establish compensatory mitigation requirements. The goal of using a watershed approach is to maintain and improve the quality and quantity of aquatic resources within watersheds through strategic selection of compensatory mitigation sites. Most of the permanent fill to wetlands and streams from the Project will occur in the Crooked Creek watershed. Since a watershed plan has not been developed for Crooked Creek, Donlin Gold prepared this watershed analysis to provide additional information to the district engineer. The analysis includes descriptions of watershed characteristics, a summary of potential impacts to aquatic resources, and opportunities for mitigation.

Watershed Overview

The Crooked Creek HUC-10 watershed (Figure 7) is located within the Kuskokwim River basin in southwest Alaska and covers an area of 215,067 acres (approximately 0.67 percent of the Kuskokwim River watershed). The watershed is situated in a zone of discontinuous permafrost in the southwest portion of the Kuskokwim Mountains region (Pewe 1975). Crooked Creek, a tributary of the Kuskokwim River, is the largest stream in the watershed. As the name indicates, it is a sinuous stream, with a relatively low gradient, and channel widths ranging from approximately 50 feet in the upper reaches to 340 feet at its confluence with the Kuskokwim River.

The Crooked Creek watershed is predominantly undeveloped and includes large expanses of wetlands and streams that provide habitat for fish and wildlife. Historical placer mines, hard rock mining exploration areas, and the village of Crooked Creek are the only anthropogenic ground disturbing activities currently in the watershed. The village of Crooked Creek, located at the mouth of Crooked Creek along the north bank of the Kuskokwim River, is the only established community within the watershed.

Landcover

The Crooked Creek watershed landcover includes a mosaic of vegetated areas with a few barren locations, including disturbed areas. Landcover classification for the Crooked Creek watershed was derived from Landsat 7 ETM+ satellite imagery (2001-2002) and classified using the Alaska Vegetation Classification (Viereck et al. 1992) (Figure 8). The dominant vegetation is typical of Interior Alaska and includes needleleaf woodland and needleleaf forest, mixed wood forest, low shrub, and broadleaf forest/tall shrub. Table 14 provides a list and percentages of each landcover type found in the Crooked Creek watershed. At present, 3,579 acres (1.66 percent) of the Crooked Creek watershed are classified as barren. This includes approximately 164 acres (or 0.08 percent of the watershed) of anthropogenic ground disturbance that has resulted from historical placer mining, mine exploration activities, and the village of Crooked Creek.

Figure 7 Crooked Creek Watershed (HUC-10)

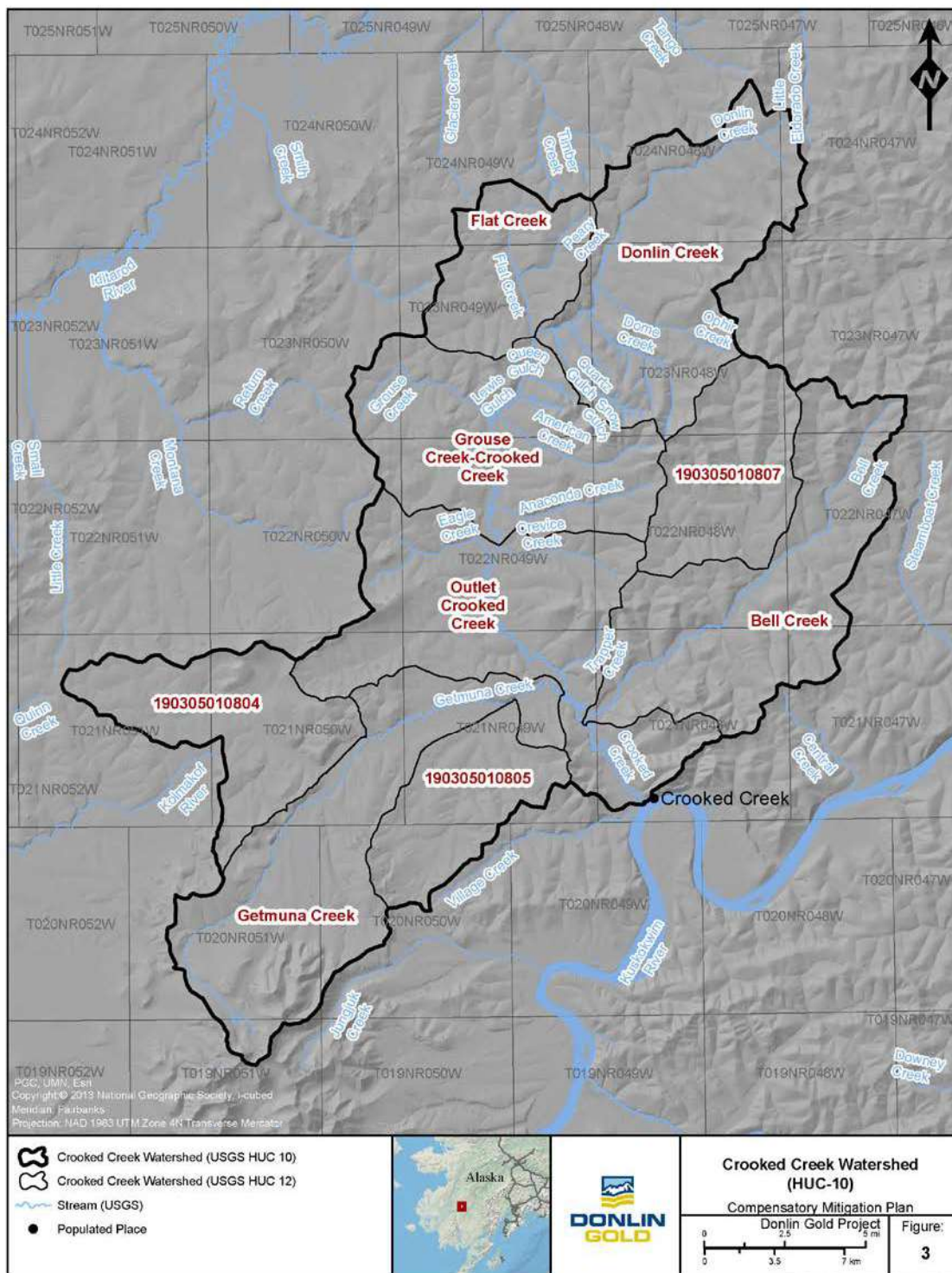
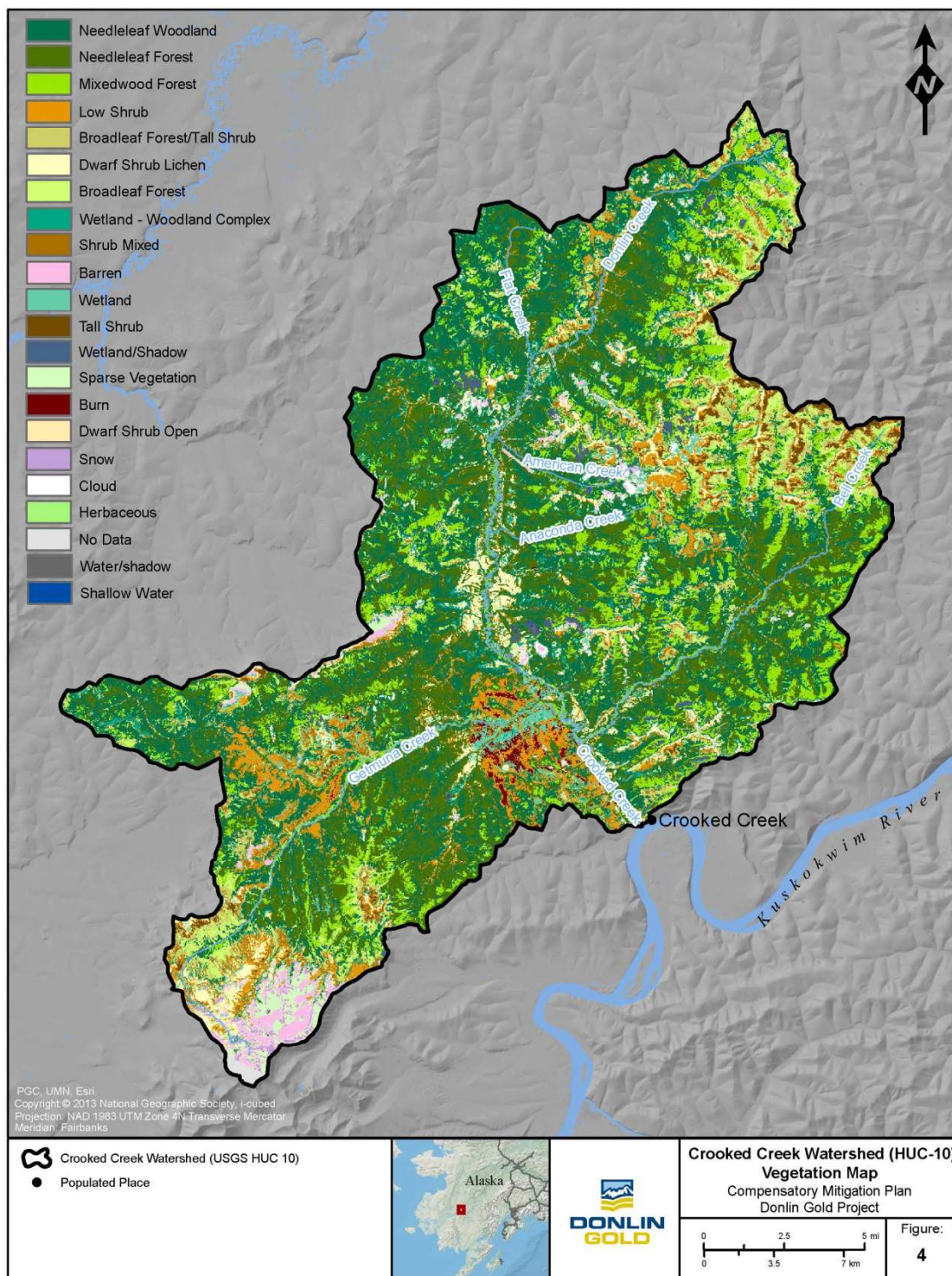


Figure 8 *Crooked Creek Watershed (HUC-10) Vegetation Map*

Land Ownership

The Crooked Creek land ownership in the watershed includes Federal and State public lands (58.8 percent), Alaska Native corporation lands (41.1 percent) (see Table 15 and Figure 9), and a small percentage of other private lands (0.1 percent). Alaska Native corporation lands are privately owned by TKC and Calista. TKC is the largest surface land owner in the watershed. Both Alaska Native corporations have the desire to realize economic benefits from their lands for their shareholders and other ANCSA corporations through responsible development. There are no established administrative boundaries within the watershed that would protect lands or wetlands from potential future development.

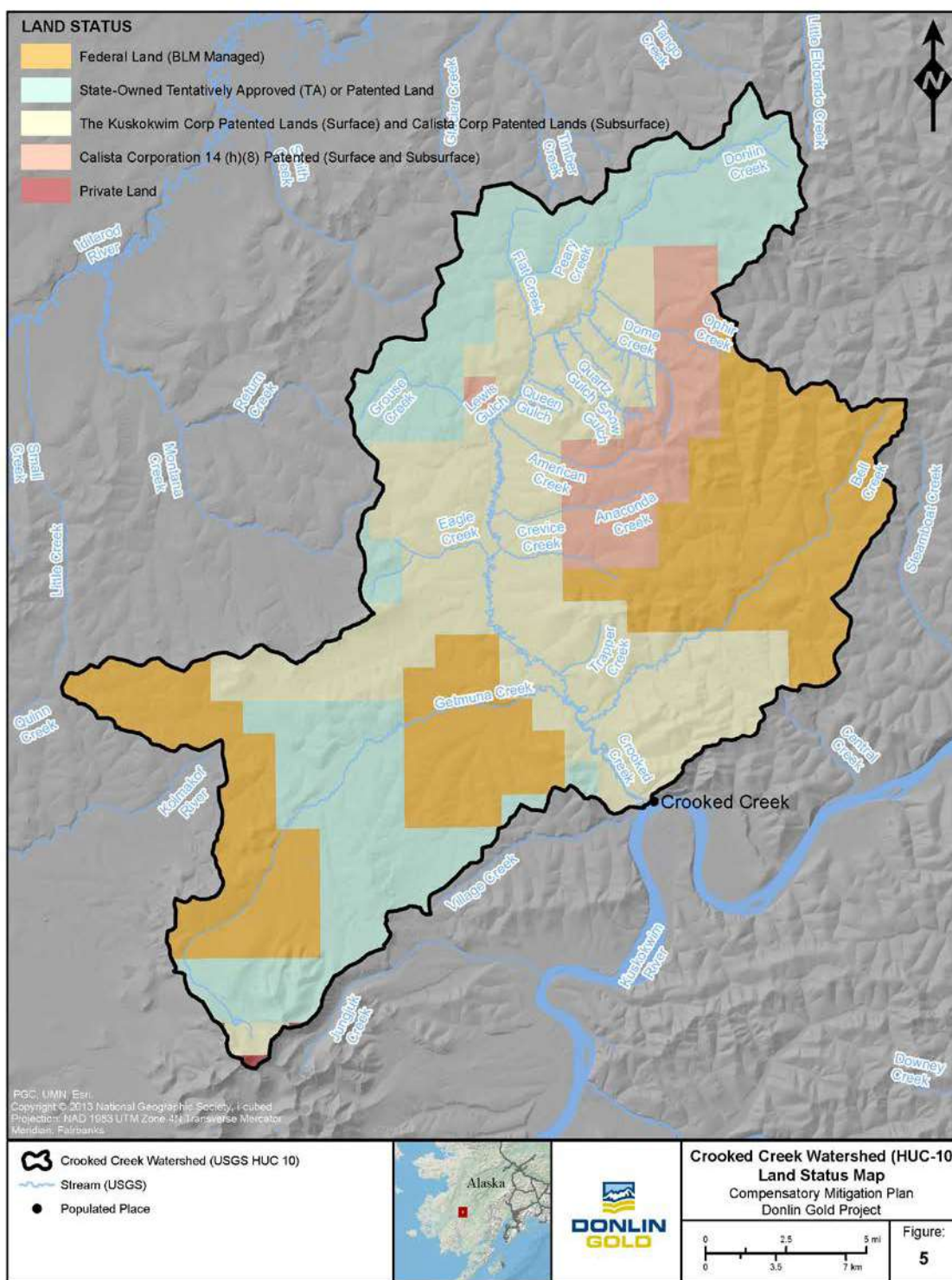
Table 14 Vegetation Type within Crooked Creek (HUC-10) Watershed (Percentage)

Vegetation Type	Watershed Percentage
Needleleaf Woodland	30.02
Needleleaf Forest	23.59
Mixedwood Forest	11.56
Low Shrub	6.64
Broadleaf Forest/Tall Shrub	5.27
Dwarf Shrub Lichen	4.63
Broadleaf Forest	4.33
Wetland – Woodland Complex	3.86
Shrub Mixed	1.76
Barren	1.66
Wetland	1.57
Tall Shrub	1.18
Wetland/Shadow	0.94
Sparse Vegetation	0.81
Burn	0.63
Dwarf Shrub Open	0.61
Snow	0.24
Cloud	0.20
Herbaceous	0.18
No Data	0.16
Water/shadow	0.12
Shallow Water	0.03
Total	99.99

Table 15 Land Ownership Status within the Crooked Creek (HUC-10) Watershed

Ownership Status	Area (Acres)	Percent of Land
Federal Land (BLM Managed)	68,421.9	31.8
State-owned.		
Tentatively Approved or Patented Land	58,071.9	27.0
The Kuskokwim Corp Patented Lands (Surface) and Calista Corp Patented Lands (Subsurface)	70,511.2	32.8
Calista 14(h)(8) Patented (Surface and Subsurface)	17,814.0	8.3
Other Private Land	248.6	0.1

Figure 9 Crooked Creek Watershed (HUC-10) Land Status Map



Wetlands

Wetlands data for the entire Crooked Creek watershed are provided by the USFWS National Wetlands Inventory (NWI) (USFWS 2018). A comparison of the areas mapped in detail for Donlin Gold using the USACE delineation approach with the NWI assessment indicates that the NWI likely overstates the extent of wetland area, but the NWI still provides a useful estimation of total wetland acres in the watershed. The NWI data indicate that wetlands occupy 45.8 percent (98,508 acres) of the Crooked Creek watershed. The dominant wetland type is freshwater forested/shrub wetlands which accounts for 99.2 percent. Freshwater pond and lake habitat are the least abundant wetland types in the watershed (less than 1 percent). A breakdown of the NWI wetland types observed in the Crooked Creek watershed is provided in Table 16.

Table 16 *Summary of Wetland Types within the Crooked Creek (HUC-10) Watershed*

NWI Wetland Type	Area (Acres)	Percent (%)
Freshwater Emergent Wetland	733	0.7
Freshwater Forested/Shrub Wetland	97,745	99.2
Freshwater Pond	10	0
Lake	20	0
Total	98,508	99.9

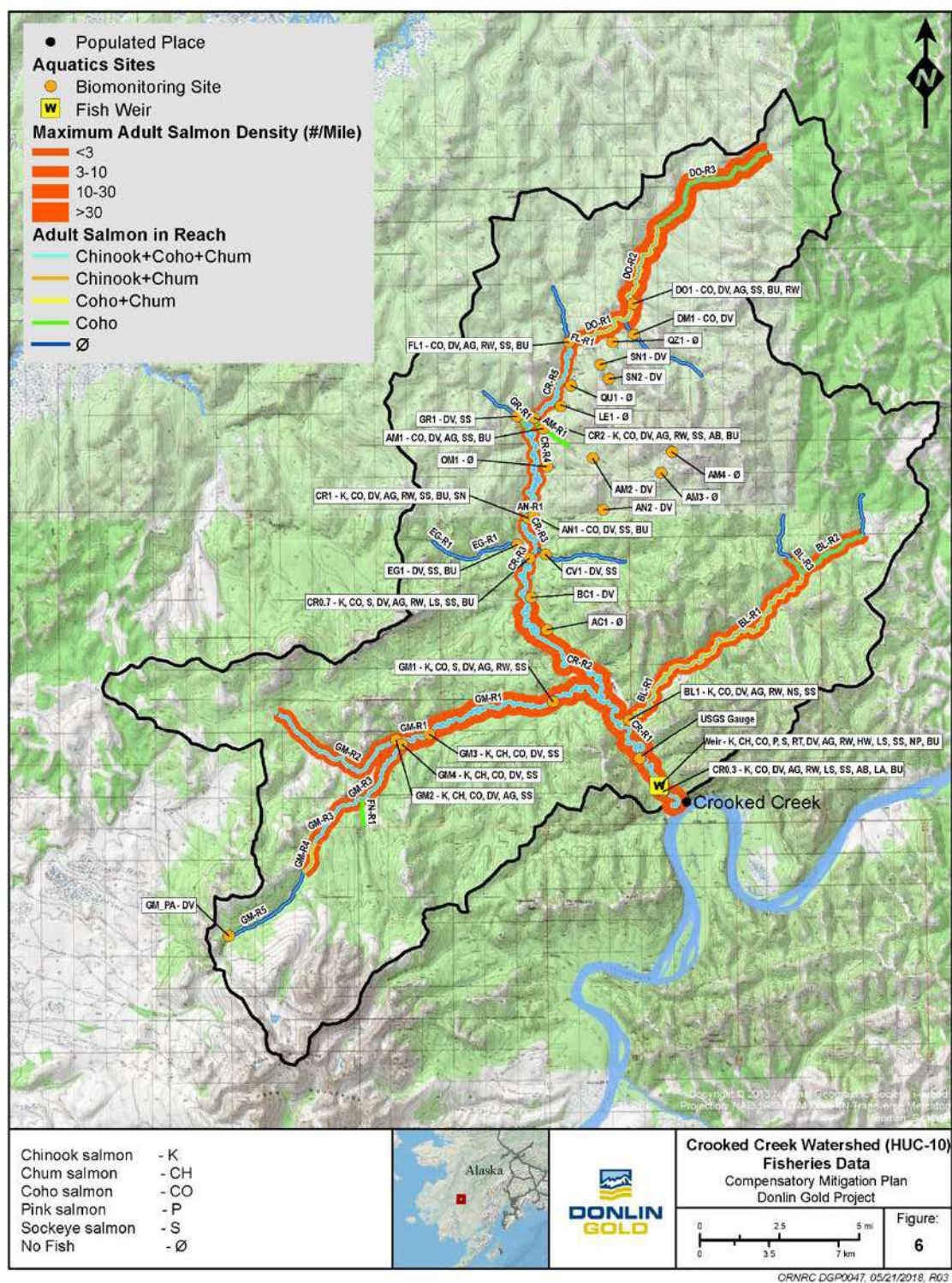
Source: USFWS 2018

Fish

Fish studies were conducted across the Crooked Creek drainage between 1996 and 2014 (OtterTail 2014a). In 2004, a comprehensive aquatic biomonitoring program was initiated as part of the Project which included general fish sampling (electrofishers and minnow traps), aerial salmon spawning surveys, fish tissue metals sampling and analysis, periphyton sampling, and aquatic macroinvertebrate sampling. In 2008, a resistance-board fish weir was constructed and installed near the mouth of Crooked Creek to better estimate salmon escapement. An intensive stream habitat survey was conducted in 2009 to document the aquatic habitat throughout the Crooked Creek mainstem. Although these studies have focused on the Project, they provide relevant information to the overall watershed.

Fish species identified within the Crooked Creek watershed are presented in Table 17 by HUC-12 where data are available. A fish distribution map for the Crooked Creek watershed is provided as Figure 10. Fish population assessments within the Crooked Creek drainage show that the system supports spawning populations of Chinook, chum, and coho salmon. Since 2008, when the fish weir was constructed, limited numbers of sockeye salmon and pink salmon have also been documented. Neither Chinook salmon nor chum salmon have been documented in tributaries to Crooked Creek, except for the larger Donlin Creek and Getmuna Creek drainages. In contrast, limited numbers of coho salmon have been reported in a number of tributaries. Aerial adult salmon surveys determined that the watershed includes a total of 464,136 linear feet of salmon spawning reaches (Table 18). The longest salmon spawning stream reach in the watershed is Crooked Creek, but Getmuna Creek, Bell Creek, and Crooked Creek downstream from Getmuna Creek support the majority of overall documented salmon spawning.

Figure 10 Crooked Creek Watershed (HUC-10) Fisheries Data



Other resident fish species are Dolly Varden, Arctic grayling, round whitefish, slimy sculpin, burbot, humpback whitefish, longnose sucker, northern pike, Alaska blackfish, Alaskan brook lamprey, and nine-spine stickleback.

Table 17 *Fish Species Identified within the Crooked Creek Watershed (2004-2014)*

Fish Species Family	Species	Common Name	Bell Creek	Donlin Creek	Flat Creek	Grouse Creek*	Getmuna Creek	Crooked Creek
Salmonidae	<i>Oncorhynchus tshawytscha</i>	Chinook salmon	X				X	X
	<i>Oncorhynchus keta</i>	Chum salmon	X	X			X	X
	<i>Oncorhynchus kisutch</i>	Coho salmon	X	X	X	X	X	X
	<i>Oncorhynchus gorbuscha</i>	Pink salmon						X
	<i>Oncorhynchus nerka</i>	Sockeye salmon	X				X	X
	<i>Oncorhynchus mykiss</i>	Rainbow trout						X
	<i>Salvelinus malma</i>	Dolly Varden char	X	X	X	X	X	X
	<i>Thymallus arcticus</i>	Arctic grayling	X	X	X		X	X
	<i>Prosopium cylindraceum</i>	Round whitefish	X	X	X		X	X
	<i>Coregonus pidschian</i>	Humpback whitefish						X
Catostomidae	<i>Catostomus catostomus</i>	Longnose sucker						X
Cottidae	<i>Cottus cognatus</i>	Slimy sculpin	X	X	X	X	X	X
Esocidae	<i>Esox Lucius</i>	Northern pike						X
Umbridae	<i>Dallia pectoralis</i>	Alaska blackfish						X
Petromyzontidae	<i>Lampetra alaskensis</i>	Alaskan brook lamprey						X
Gadidae	<i>Lota lota</i>	Burbot		X	X			X
Gasterosteidae	<i>Pungitius pungitius</i>	Nine-spine stickleback						X
Total			8	7	6	3	8	17

*The majority of MA facilities are located in the Grouse Creek HUC

Table 18 *Adult Salmon Stream Reaches*

Stream	Adult Salmon Reach (Feet)
Bell Creek	89,710
Crooked Creek	175,207
Donlin Creek	78,108
Flat Creek	449
Getmuna Creek	118,282
Grouse Creek*	2,380
Total	464,136

*The majority of MA facilities are located in the Grouse Creek HUC

Channel Habitat Classification

A classification of in-stream habitat for the entire Crooked Creek watershed is necessary to quantify the amount of fish habitat in the watershed. Donlin Gold completed a detailed in-stream habitat field survey in 2009 to document aquatic habitat, but the study was limited to the Crooked Creek mainstem (OtterTail 2015). Extending this field survey to the remaining areas of the watershed is not practical. Instead a separate rapid channel habitat classification model was completed as a desktop study to establish channel habitats suitable for fish in the Crooked Creek watershed.

Watershed Channel Habitat Classification Model

A rapid channel habitat classification model for the entire watershed was created using available data sources, and best professional judgement. The model used streamflow data, elevation data, and existing fish presence data to classify channel habitat for 1:63360 scale streams. Average streamflow for the month of July generally represents the lowest summer water elevation and is a good indicator for availability of aquatic habitat; elevation data were used as a surrogate for gradient, which typically affects fish passage; and fish presence data were used to determine the streamflow and elevation parameters where fish presence was not detected.

The rapid channel habitat classification model employed the following data inputs:

- **Streamflow** – Streamflow conditions in the watershed were characterized by estimating average July discharge at 375 locations. Locations were selected by taking the stream network and defining nodes where stream segments intersect. For each location, the upstream watershed area was calculated using an iterative ArcGIS script. The nodes have an average watershed area of 27 square miles (sq. mi.), with a range between 0.4 and 331 sq. mi. An average July runoff depth was then applied to estimate average July streamflow for each of the nodes. The average July runoff depth was estimated using the deterministic water balance model (WBM) developed by BGC (2011) for the Project mine site. This model is calibrated to site conditions based on regional climate data for the period 1940-2010. For this 71-year period, the average July runoff is 1.50 inches in the American Creek watershed. Streamflow data are also available near the mouth of Crooked Creek at a gaging station maintained by the U.S. Geological Survey (USGS). This station, identified as Crooked Creek near Crooked Creek, Alaska (#15304010), has been in operation since July 1, 2007. For the available period of record, the average July discharge is 432 cubic feet per second (cfs). Based on a watershed area of 330 sq. mi., this equates to a runoff depth of 1.53 inches, which is essentially identical to the American Creek estimate from the WBM.
- **Elevation** – The USGS National Elevation Dataset was used to determine elevation ranges for each stream within the watershed.
- **Fish Presence Data** – Fish presence was obtained from the aquatic biomonitoring program 2004-2014 and included fish presence data at 29 aquatic monitoring sites; aerial adult salmon survey data for the entire watershed; and individual upper reach fish presence determinations for American and Anaconda creeks, and Snow Gulch.

Using geographic information system spatial analysis techniques, the streamflow, elevation, and fish presence datasets were intersected, to create a stream database containing data from all inputs. The resulting stream dataset was then segregated into fish habitat suitability categories, in accordance with the parameters presented in Table 19. These parameters were determined as follows: streamflow values were segregated based on the Jenks natural breaks clustering method, and elevation limits were defined using a correlation of fish presence and elevation. Finally, the stream habitat classification was then adjusted where necessary to match known fish presence or absence in streams. For example, the model predicted that the upper reaches of Getmuna Creek were non-fish bearing, due to the elevation being greater than 250 meters and low streamflow, however, Getmuna Creek headwaters include unique high altitude deep water ponds where Dolly Varden presence is known.

The fish habitat suitability categories are:

- None – No fish habitat is predicted.
- Possible – Fish presence may be possible.
- Known or likely – Fish presence is known based on field survey data, or it is likely to include fish.

Table 19 *Crooked Creek Watershed Stream Fish Habitat Suitability Determination*

Stream Flow (cfs)	0.48 — 5		5—100		>100
Elevation Above Mean Sea Level (m)	>41.6	41.6 - 200	200 - 250	>250	41.6 — 200
Fish Habitat Suitability	None	Known or Likely	Possible	None	Known or Likely

Source: Rapid Channel Habitat Classification Model

Watershed Channel Habitat Classification

Results of the Crooked Creek watershed channel habitat modeling indicate 2,896,225 linear feet of streams. A total of 1,310,152 linear feet of streams are known to have fish or are expected to include fish, while 298,469 linear feet of streams could possibly have fish, and 1,358,327 linear feet of streams are not expected to have fish (Table 20). Primary fish species expected to use habitats within the known, likely, and possible categories can be predicted by stream reach relative location, either within the immediate historical floodplain of Crooked and Donlin Creeks, or those habitats upstream from the floodplain. Floodplain stream reaches are most likely to provide rearing habitat for juvenile coho salmon and some resident fish species such as slimy sculpin, Dolly Varden and Arctic grayling. Stream reaches upstream from the floodplain areas are most likely to provide habitat for Dolly Varden and slimy sculpin. The total length of streams identified in the analysis is less than those identified by the PJD (Michael Baker 2016) for similar areas. This is due to differences in the mapping scale. This would affect the smaller tributary streams in upper drainages that typically do not provide fish habitat. Thus, the total length of streams reported in the model should be considered underreported.

Figure 11 shows the results of the stream habitat model predictions.

Figure 11 Crooked Creek Watershed (HUC-10) Stream Habitat Model Results

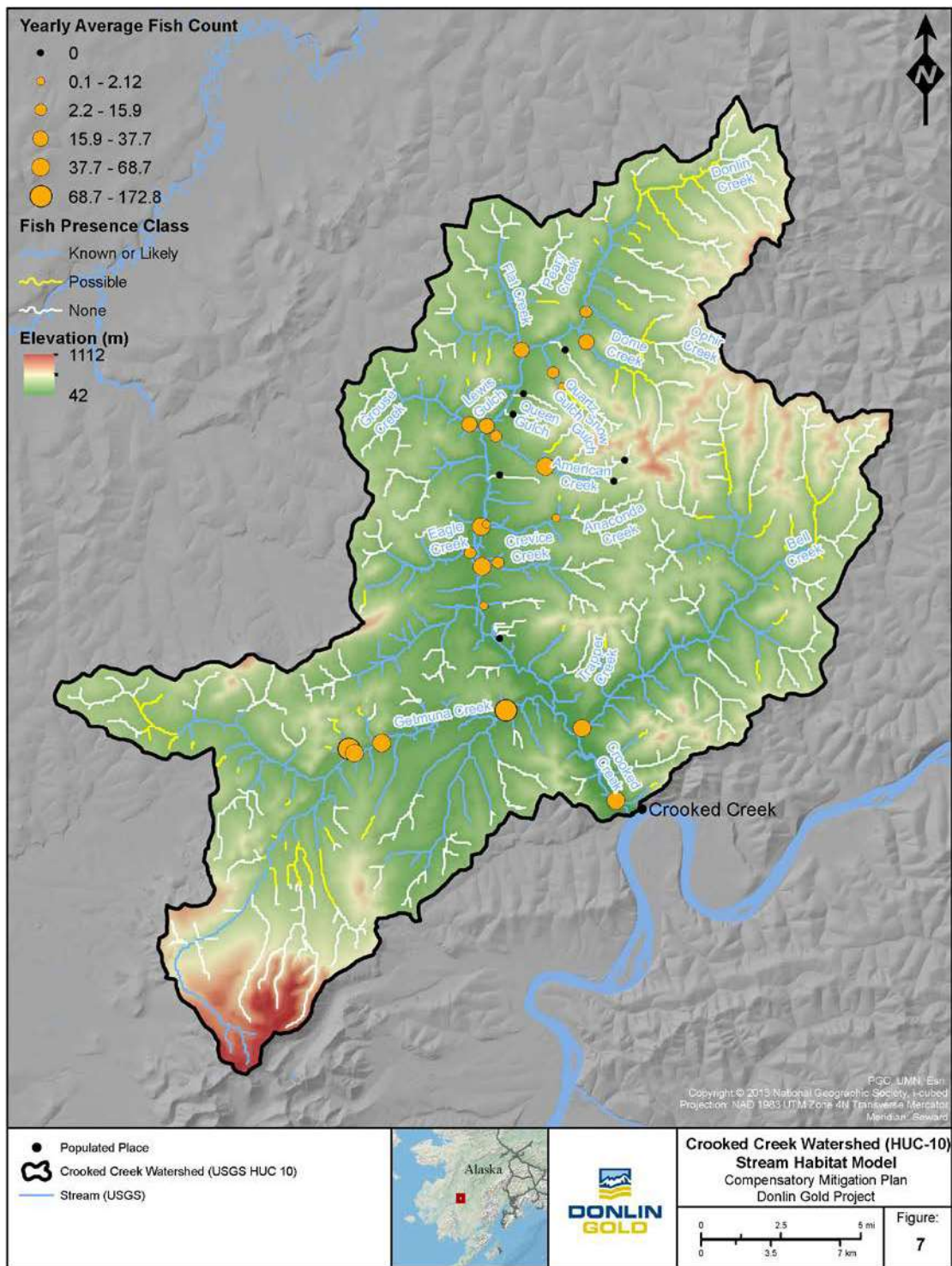


Table 20 *Crooked Creek Watershed Channel Habitats*

Fish Habitat	Linear Feet	Percent (%)
None	1,307,605	45
Possible	278,469	10
Known or Likely	1,310,152	45
Total	2,896,225	100

Source: Rapid Channel Habitat Classification Model

Aquatic Habitat Mapping

An aquatic habitat mapping study was conducted in 2009 along a 33-mile Crooked Creek mainstem reach from the confluence of Flat and Donlin creeks to the confluence with the Kuskokwim River (OtterTail 2012). The study mapped base flow habitat conditions and adult salmon spawning locations, and areas of fish rearing habitat were identified. A total of 840 habitat mapping units (HMUs) were mapped (Table 21).

Table 21 *Crooked Creek Watershed Habitat Mapping Summary, Wetted Surface Area (m²)*

Parameter	Run	Fast Run	Riffle	Pool	Glide	Backwater	Side Arm	Abandoned Channel	Total
Number of HMU	325	5	206	118	16	83	39	48	840
Percent of Total Wetted Surface Area	61.4	0.4	12.2	7.6	4.7	4.6	3	6.1	100
Total	568,638	3,793	112,729	70,587	43,433	42,553	27,375	56,587	925,696

Source: OtterTail 2012

Run habitat was the most abundant habitat type, riffle habitat was the second most numerous, and pool habitat was limited. Other documented habitat types were fast run, glide, backwater, side arm, and abandoned channels. Run habitat comprised 61.4 percent of the total wetted surface area and 325 of the 840 HMU types were mapped as runs.

Riffle habitat comprised 12.2 percent of the total wetted surface area and 206 of the 840 HMU types were mapped as riffles. Many of the riffle habitats were shorter than other HMU types and were often found to quickly transition into run or pool habitat. Abundant shallow margins with little flow made up 30.2 percent of all riffle habitat samples. While fish sampling was not part of this habitat mapping study, an abundance of juvenile fish was typically observed during the surveying of riffle margin areas. In addition, numerous juvenile salmonids from fish studies have been documented in these Crooked Creek riffle margin habitats.

Pool habitat made up 7.6 percent of the total wetted surface area and 118 of the 840 HMU types were mapped as pool habitat. Based on the habitat type criteria, much of what would also likely be considered run habitat at a higher flow rate was identified as pool habitat (OtterTail 2014). Substrates in the pool habitats were primarily sand and small cobble. Over 20 percent of all pools sampled contained abundant amounts of woody debris and/or shallow margins, which are considered prime habitat for juvenile salmon rearing. Juvenile coho salmon, in particular, almost entirely stay in pool habitat and avoid riffle areas (Morrow 1980) or areas with higher velocities.

Glide and fast run habitat were not very common due to the sinuous, meandering sections within the Crooked Creek mainstem, which are not suitable conditions for glide and fast run habitat. Observations of fast runs only occurred in the lower part of Crooked Creek where the stream is larger.

Backwaters, side arms, and abandoned channels were the most dynamic of the habitat types that were mapped during the survey. Backwater habitat made up 4.6 percent of the total wetted surface area and 83 of the 840 HMU types were mapped as backwater habitat. Much of the backwater habitat appeared nearly disconnected from the mainstem at the sampled low flows. Juvenile fish were captured in these backwater habitats during sampling, and well documented literature supports that rearing coho salmon prefer these areas of slower water that provide cover (Narver 1978, McMahon 1983, Raleigh et al. 1986, Morrow 1980, ADF&G 1986).

Side arm habitat was rare and made up approximately 3 percent of the total wetted surface area and 39 of the 840 HMU types were mapped as side arm habitat. Side arm habitat was observed to be surrounded by low elevation sediment bars next to the main channel, but not all sections of divided channel were classified as side arms based on the habitat type criteria. The majority of the side arm habitat contained abundant shallow margins, woody debris, and canopy cover, and was considered fair to good habitat for salmon.

Abandoned channels (disconnected habitat) made up 6.1 percent of the total wetted surface area and 48 of the 840 HMU types were mapped as abandoned channel habitat. Not all abandoned channels were mapped. Abandoned channels were considered excellent salmon habitat primarily due to observations of abundant fish (OtterTail 2015).

Watershed Conditions and Opportunities

Existing data indicate the Crooked Creek watershed is largely undeveloped and opportunities to restore wetlands and streams are limited due to the low total disturbance in the area. The following opportunities, however, do exist:

- Historical placer mining development in the Donlin Creek and Flat Creek areas created stream channel modifications, and exposed soils, that appear to be affecting water quality in the upper reaches of the Crooked Creek watershed. Fish passage to habitats upstream from the placer mining activity in both drainages has also been limited, or eliminated. The Snow Gulch and Ruby and Queen gulches historical placer mining areas present aquatic habitat creation and restoration opportunities in the watershed. Fish passage could also be restored to stream habitats upstream from the disturbed areas in each stream.
- The Crooked Creek watershed includes few freshwater pond and shallow lake habitats (less than 1 percent of the watershed area). However, analogous habitats do occur as backwaters to Crooked Creek (estimated to be only 4.6 percent of the HMU area) and have been documented to be productive for juvenile coho salmon (OtterTail 2014b). This indicates that these habitats are limited and the addition of ponds and/or backwater areas is a substantial opportunity for watershed enhancements.

Watershed Impacts and Mitigation

Wetlands

The long-term and permanent impacts caused by the Project include 2,876 acres of wetlands. The majority of these impacts are associated with the development of the MA and TA facilities (2,676 acres of wetland fill) most of which are in the Crooked Creek watershed.

These Project impacts are located in a watershed with large expanses of wetlands that have little risk of development. The wetland fill impacts would affect approximately 2.7 percent of the inventoried wetlands in the watershed. Currently, the Project is the only proposed development in the watershed, and it is extremely unlikely that other large developments will be proposed in the Crooked Creek watershed for the foreseeable future.

The dominant wetland types impacted by the Project are abundant in the watershed, and most impacts are confined to the American and Anaconda creek drainages. Palustrine forested/palustrine scrub-shrub wetlands impacted by the Project (2,632 acres) account for 99.2 percent of the wetlands in the entire watershed (the most common wetland type). The Project impacts would cause a reduction of 2.7 percent of this type of wetlands in the Crooked Creek watershed (Table 22). In contrast, palustrine pond wetlands are scarce in the watershed (less than 1 percent of the watershed wetlands). With the Upper Crooked Creek PRM, the net gain will be 15.2 acres of pond habitat; or an increase of 152 percent in the watershed. The other benefit is the restoration of 8,892 linear feet of stream which will connect pond habitats. The Project will cause a reduction of a combined 2,676 acres of palustrine emergent forested and palustrine scrub shrub wetlands. The Upper Crooked Creek PRM will restore 93.0 acres of degraded wetland stream floodplain to HGM riverine wetlands as palustrine emergent, and palustrine scrub-shrub wetland.

Table 22 Summary of Wetland Impacts in the Crooked Creek Watershed

Wetland Types	Crooked Creek Watershed (Acres)	MA/TA Permanent Fill (Acres)	Crooked Creek Watershed Wetlands Permanent Fill (Percent)	Proposed Upper Crooked Creek PRM Restored (Acres)	Crooked Creek Watershed Wetland Permanent Fill After Mitigation (Percent)
Palustrine Emergent, Palustrine Forested/ Palustrine Scrub-Shrub	98,478	2,676	-2.7 (Loss)	93	-2.6 (Loss)
Palustrine Pond	10	0	0	15.2	152 (Gain)
Lake	20	0	0	0	0
Total	98,508	2,676		108	

Channel Habitats

Construction of the Project would cause the permanent loss of 173,953 linear feet of streams. All these impacts are primarily associated with the development of the MA, and secondarily the TA facilities, in

the Crooked Creek watershed. This represents roughly 6 percent of all streams in the Crooked Creek watershed. It includes intermittent streams (only contain flowing water part of the year) “upper” watershed perennial streams. Generally, upper watershed perennial streams are defined as streams with low gradient and slow water velocity that carry some water flows throughout the year. Neither of these types of streams constitute significant losses in terms of aquatic habitat for fish other than their water and water quality contributions downstream to lower perennial streams where more suitable aquatic habitat exists. Adult spawning salmon reaches in the Crooked Creek watershed include mainstem Crooked Creek, and the largest upper perennial watershed streams like Getmuna, and Bell Creeks, or relatively small portions of upper perennial streams with sufficient flow and habitat like American, Anaconda, Flat, and Grouse Creeks. Intermittent streams, and most of the upper perennial streams are not currently used by adult spawning salmon.

Construction of MA facilities within the American Creek watershed would result in a loss of 21,648 linear feet of upper perennial aquatic fish habitat, of which approximately 2,640 linear feet are documented as anadromous habitat for coho salmon rearing. Additionally, construction and operation of the TSF within the Anaconda Creek watershed would result in a loss of 7,920 linear feet of aquatic habitat, including the potential to affect 865 linear feet of coho salmon rearing habitat. No spawning habitat will be directly impacted by these facilities (Owl Ridge 2017).

Although not a direct effect, and thus not the subject of this CMP, the loss of water contributions to Crooked Creek (because of the estimated permanent stream losses of intermittent and upper perennial streams, and the predicted water flow reductions in Crooked Creek because of mine dewatering activities) would result in the following habitat reductions from existing flow conditions below the MA at the maximum predicted drawdown period (year 20 of the mine life) (OtterTail 2015).

- Summer
 - 3 percent (3.17 acres) of overall aquatic habitat
 - 6 percent (0.87 acres) of riffle habitat
 - 3 percent (2.11 acres) of run habitat
 - 2 percent (0.19 acres) of pool habitat
- Winter
 - 6 percent (4.2 acres) of overall aquatic habitat
 - 11 percent (1.03 acres) of riffle habitat
 - 5 percent (2.91 acres) of run habitat
 - 3 percent (0.26 acres) of pool habitat

The direct losses as a result of the permanent fill to streams are 173,953 linear feet of streams, including 29,568 linear feet of fish bearing streams. The loss of 29,568 linear feet of fish bearing streams represents approximately a 1.9 to 2.3 percent loss of fish habitat in the entire watershed. While up to 2.3 percent of modeled fish-bearing stream habitat would be eliminated via the loss of the fish bearing portions of American and Anaconda creeks, the habitats being eliminated have low overall fish use, and low contributions to overall numbers of fish identified in baseline sampling. The aquatic baseline biomonitoring program sampling from 2004 through 2014, which did not include Donlin Creek tributaries upstream from Dome Creek, calculated the annual average fish captured by species among

all of the 300-foot reaches sampled: The average annual juvenile coho count was 400 fish, and American and Anaconda Creeks contributed on average 6 and 0.1 (only one juvenile coho was captured in Anaconda in 2011 over the nine years surveyed) juvenile coho respectively. Resident fish species contributions from American and Anaconda Creeks were similarly low: The average slimy sculpin captured for all reaches sampled was 2,185 fish, and the combined American and Anaconda Creeks annual average contribution was 53.4 slimy sculpin; and the average Dolly Varden captured for all reaches samples was 200 fish, while the combined American and Anaconda Creeks annual average contribution was 13 Dolly Varden. As noted above, the annual baseline program did not include resident fish sampling in tributaries upstream from Dome Creek, which according to the rapid channel modelling effort are predicted to contain additional fish habitat for these species. Overall, loss of the habitat used by fish in American and Anaconda Creeks is unlikely to affect overall fish populations in the drainage because similar habitat is available for fish that would be displaced.

Connected backwater habitats were investigated primarily in the middle reaches of Crooked Creek over a two-year period by sampling 100-foot reaches by electrofishing and sampling with minnow traps. The data suggest that for juvenile coho salmon, these habitats are probably some of the most productive in the drainage. Electrofishing produced 144.5 juvenile coho per 100 feet on average and minnow trap reaches, though variable in length and number of traps, produced an annual average of 132.5 juvenile coho per backwater tested (OtterTail 2014b). While baseline and backwater sampling methods are not directly comparable, connected backwater habitats considering electrofishing results are estimated to produce 433.5 juvenile coho per 300 feet of sampling. When factoring in minnow trapping results, this number increases. In total, this limited habitat type has the potential to function as highly productive fish habitat, particularly for juvenile coho salmon. In comparison to the coho salmon contributions from American and Anaconda Creeks, slow moving backwaters and ponds are likely to have considerably more fish production potential than those lost in the two creeks.

Data from other studies supports the findings related to the importance of backwater habitat. For example, voluntary restoration of disturbed stream habitats in the upper Fish Creek drainage at the Fort Knox Gold Mine in Interior Alaska created wetland, stream, and shallow pond habitats analogous to existing backwater habitats in the Crooked Creek drainage as well as those proposed in the Upper Crooked Creek PRM Plan. The mitigation successfully created spawning habitat and highly productive rearing habitat for Arctic grayling and burbot (Ott and Morris 2005). Age 0 Arctic grayling residing within the created wetlands habitats were nearly twice as large as age 0 fish from colder stream reaches in the drainage, illustrating increased productivity and likely increased probability of future survival provided by the created habitats (Ott and Morris 2005).

Because of the direct loss of known fish bearing habitat in American and Anaconda Creeks, Donlin Gold has proposed mitigation through restoration that will create the highest potential for fish habitat and aquatic productivity lift in the drainage. The low overall availability of backwater habitats in the drainage, and the near complete lack of pond habitats provide an opportunity for habitat enhancements. Review of coho salmon juvenile numbers encountered in the backwater habitats along Crooked Creek and the resident fish benefits observed in shallow constructed wetlands at the Fort Knox Mine indicate that addition of shallow ponds and backwaters in previously disturbed habitats in the drainage will be beneficial to overall drainage productivity.

Habitat enhancements proposed for the Ruby and Queen Gulches disturbed areas would create approximately 2,931 feet of relatively low gradient stream habitat primarily within the historical floodplain of Crooked Creek. Modelling and fish sampling data show these habitats are the most utilized within the small tributaries to Crooked Creek. The enhancements would also restore fish passage to approximately 7,048 feet of upstream stream habitat, which is currently unavailable to fish. Perhaps most significantly, the proposed Upper Crooked Creek PRM Plan will create about 15.2 acres pond and backwater habitats, those documented to be considerably more productive for juvenile coho salmon than habitats that would be eliminated in American and Anaconda Creeks.

Similarly, habitat enhancements proposed within the disturbed areas of Snow Gulch would create 4,421 feet of stream habitat within the historical floodplain of Crooked Creek and upstream within the Snow Gulch floodplain. Low gradient habitats would be created within the floodplain of Crooked Creek while higher gradient stream habitat would be created through enhancement of the Snow Gulch area to help restore access to the upper drainage and to stabilize the existing constricted channel configurations. While these habitats are upgradient from the Crooked Creek floodplain, they are within areas documented to have some periodic fish use during baseline sampling, and within the area of the stream that modelling suggests would be fish habitat. The new stream habitats would also create improved access to 12,672 linear feet of upstream habitat that would be restored. The proposed Upper Crooked Creek PRM Plan would further create backwater and pond habitat within the Crooked Creek and Snow Gulch floodplains. Depending on the winter flows, post construction and filling of the Snow Gulch Reservoir, there is additional potential that viable spawning habitat for coho salmon will result from the PRM proposed in Snow Gulch.

Restoration work proposed in Quartz Gulch would add potential backwater and stream habitats where none currently exists. Restoration would create 1,630 linear feet of stream habitat largely within the Crooked Creek historical floodplain that could be used by juvenile coho salmon and resident fish species. An additional 6,258 linear feet of possible fish bearing stream habitat would be made accessible to fish through the PRM Plan. Stream habitats upstream from the Crooked Creek floodplain would be possible habitat primarily for resident fish species such as Dolly Varden and slimy sculpin.

Summary and Conclusion of Watershed Impacts to Wetland and Channel Habitats

The Project will discharge fill that will result in the permanent loss of 2,676 acres and 173,953 linear feet of WOUS in the Crooked Creek watershed. This will result in adverse effects to the aquatic ecosystems within the American and Anaconda Creek drainages. However, because of the abundance of similar wetland types, and the limited fish habitat contribution of the impact areas to the overall watershed, this will not create significant adverse effects to the aquatic ecosystem and diversity of the overall Crooked Creek watershed.

Approximately 2.7 percent of the wetlands, and less than 6 percent of the streams in the Crooked Creek watershed, will be lost as a result of the Project. Impacts will be primarily confined to the American and Anaconda Creek drainages, and the type of palustrine forested/palustrine scrub-shrub wetlands and functions that will be permanently lost are abundant in the Crooked Creek watershed. After implementation of the Upper Crooked Creek PRM Plan, the percent of impacted wetlands will decrease to 2.6 percent and rarely occurring, yet highly productive, palustrine ponds will increase 152 percent.

Therefore, significant adverse effects to the aquatic ecosystem, including wetlands in the Crooked Creek watershed are not anticipated.

Losses of fish habitat because of elimination of American and a portion of Anaconda Creeks will have negligible effect on both resident fish and salmon species in the overall Crooked Creek drainage. While up to 2.3 percent of fish habitat will be lost, baseline fish data document these habitats are some of the lowest producing fish habitats in the Crooked Creek watershed. The most important salmon spawning habitats occur either upstream or downstream from the Project. Greater than 90 percent of Chinook and chum salmon spawning occurs downstream of the Project and greater than 80 percent of coho spawning occurs either upstream or downstream from the Project. Indirect effects of pit dewatering and the loss of perennial drainages on Crooked Creek flows will be primarily limited to the middle reaches of the creek between Snow Gulch and Crevice Creek where primary fish use is for juvenile rearing. Despite the potential reductions in stream flow, primary habitat loss during rearing periods will total approximately 3 percent within the potentially impacted area and will not reduce or degrade habitat in a manner that population level effects are anticipated. Significant adverse effects to important spawning habitats are thus not anticipated.

As described in Section 6.0 and Attachment D, high value aquatic habitat proposed for restoration as part of the Upper Crooked Creek PRM Plan, especially in Ruby/Queen and Snow Gulches, will reduce the percentage of overall linear stream fish habitat loss by 32 percent. The proposed palustrine wetlands would act as backwaters, which are important for juvenile coho, and would increase backwater habitats in Crooked Creek. Overall, the limited effects associated with the losses of American and Anaconda Creeks are expected to be more than offset by the net gains in available fish habitat and productivity from the PRM.

Finally, Donlin Gold is committed to ensuring no significant adverse effect of the aquatic ecosystem in the Crooked Creek watershed throughout Project construction, operation, and after closure. To accomplish this, Donlin Gold will implement a comprehensive Aquatic Resources Monitoring Plan (ARMP) under the provisions of its Title 16 fish habitat permits administered by the Alaska Department of Fish and Game (ADF&G). The ARMP will include aquatic resource monitoring throughout Crooked Creek and its tributaries upstream and downstream from the Project area. In addition to adult, juvenile, and spawning fish surveys, the program will also include habitat, sediment, fish tissue, and flow monitoring. Flow monitoring will specifically address both summer and winter flow conditions. Monitoring will be initiated before the start of construction to continue to provide baseline data, as needed. The ARMP will provide for detailed data analysis and reporting to ADF&G on monitoring results. It will also require specific action by Donlin Gold if the data show variability from the predicted effects on aquatic resources. The data can also be used to assess potential opportunities for creating additional ecological lift in the watershed.

8.0 Rationale for Proposed Compensatory Mitigation Credit/Impact Ratio

The Rule provides that mitigation/impact ratios greater than 1:1 should be required where preservation is proposed to satisfy compensatory mitigation requirements. In determining the appropriate higher ratio, the district engineer “must consider the relative importance of both the impacted and the preserved aquatic resources in sustaining watershed functions.” In addition, consideration is given to the likelihood of success, functional (or in this case, qualitative) differences between the impact and mitigation sites, and impacted versus preserved resource values. Donlin Gold is proposing mitigation ratios of approximately 2.2:1 for acres (including both wetlands and upland riparian buffers) and 1.6:1 for streams, considering the Upper Crooked Creek and Chuitna PRM Plans. This includes the Upper Crooked Creek and Chuitna PRM. Donlin Gold also purchased 9.8 mitigation credits to be secured from Great Land Trust. The credit calculation used a 2:1 ratio for preservation. These purchased credits are not considered or included in the ratios listed above for acres and stream length.

Within the Crooked Creek watershed, compensatory mitigation options are limited by the extent of past disturbance. While the acreages and linear feet of streams restored by the proposed Upper Crooked Creek PRM are relatively low on a quantitative basis compared to MA and TA impacts, they provide in-watershed restoration of high aquatic resource values and functions. Specifically, they provide important stream, pond, and backwater habitat for anadromous and resident fish species. In addition, the proposed stream restoration activities will be initiated immediately upon the start of construction, with streams and wetlands meeting performance standards within 3 to 5 years after construction has finished. Therefore, the restored streams and wetlands are expected to become fully functioning within the timeframe that MA and TA impacts are occurring. This is documented in the watershed assessment included in Section 7.0. Hence, they provide for local, in-watershed mitigation as well as timely mitigation to eliminate temporal losses.

After accounting for the in-watershed mitigation provided, along with the limited purchased mitigation credits that are applicable, the remaining mitigation is almost entirely provided by off-site PRM. Under Donlin Gold’s CMP, the preponderance of mitigation acres and linear feet of streams are provided by the Chuitna PRM Plan. The distance from the watersheds that will be primarily impacted by the Project could be considered in limiting the credit values. However, all other factors that USACE recognizes for credit generation support a high value for the proposed Preservation Area. Specifically:

- As summarized in Section 7.0, the Project will not significantly impact aquatic resources at the watershed level. The in-watershed restoration, when considered with the associated monitoring plans, protects the Crooked Creek watershed from significant degradation.
- The Preservation Area represents a large, contiguous interconnected area that protects important wetland and stream aquatic resources at the watershed level.
- The Preservation Area encompasses important aquatic habitat for all five Pacific salmon and additional resident fish species. The presence of the Pacific salmon species in the Preservation Area is much more diverse and abundant than that found in the Crooked Creek and tributary watersheds that will be affected by the Project.

- A portion of the Preservation Area overlaps with critical habitat for endangered Beluga whales. The salmon protected in the Preservation Area are an important food source for these whales.
- The Preservation Area represents an almost entirely pristine area that is under documented threat of near-term oil and gas, coal, and timber-related development.

To further support the high credit value of the Preservation Area, it is illustrative to consider the Debit-Credit Methodology (Methodology) adopted by USACE's Alaska District in September 2016. Donlin Gold has not specifically used this Methodology primarily because its use is optional and no functional assessment approach was accepted for the Project. However, the Methodology concepts are appropriate to consider in generally determining credit values for the Preservation Area for both wetland acres and linear feet of streams.

The initial input to the Methodology is the result of a functional assessment or other metric of the "value" of the proposed mitigation. The impacts are typically assigned a score of 1.0 and the proposed mitigation a level less than 1.0 based on these values. Since there is no approved functional assessment approach for the Project, the assigned value is subjective for the Preservation Area. However, considering the above factors, Donlin Gold believes that a functional score approaching 1.0 is justified.

The second input into the Methodology is based on the difference or delta between the anticipated condition of the Preservation Area with and without preservation. As indicated above and documented in the Chuitna PRM Plan, the Preservation Area is almost entirely pristine. With the existing, near-term threat of watershed-level degradation, it is reasonable to assume full elimination of wetland and stream function. As a result, like the functional score, a difference or delta factor approaching one is justified for undisturbed, pristine wetlands within the Preservation Area.

The final input into the Methodology is the Preservation Adjustment Factor (PAF). The PAF is calculated based on two components: threat (0.3 or 30 percent of the calculation) and ecological significance (0.7 or 70 percent of the calculation). In terms of threat, the full score of 30 percent is appropriate for the Preservation Area since there are both:

- Demonstrated threat of mining activities through extensive prospecting, which indicates there are economically recoverable reserves and commodities; and
- Demonstrated threat of oil and gas activities through exploration activities, which indicate there are economically recoverable reserves.

The ecological significance score is divided into the following four components:

- *Aquatic resources that are adjacent to or connect regionally important publicly held lands, such as: National Marine Sanctuaries, National Seashores, National and State Parks, Forests, Refuges and Wildlife Management Areas (0.10 of the overall PAF).* The Preservation Area is adjacent to the Trading Bay State Game Refuge and Susitna Flats State Game Refuge. Therefore, the full score (0.10 of the PAF) is justified for the Preservation Area.

- *Site contains aquatic resources that have been identified as significant or productive within a specified Ecoregion. Such as: Alaska's Wildlife Action Plan or Anadromous Waters Catalog (AWC), ADF&G; Aquatic Resource of National Importance.* A major portion of the Preservation Area encompasses highly productive anadromous waters. Therefore, the full score (0.30 of the PAF) is justified for the Preservation Area.
- *Aquatic resources that provide habitat important to species that have some special (Federal, State, or local) designation or importance.* The Preservation Area supports the viability of endangered Cook Inlet Beluga whales. In addition, the five Pacific salmon species are abundant in the Chuitna watershed and have special status at the State and Federal levels. Therefore, the full score (0.20 of the PAF) is justified for the Preservation Area.
- *Scarcity of Aquatic Resource Type. Such as: specific preservation to maintain diversity of habitat type within islands systems removing the threat of habitat fragmentation for fish and wildlife species (Alexander Archipelago Islands (Southeast Alaska) Kodiak and the Aleutian Chain).* Donlin Gold assumes that, while high value, the Preservation Area does not provide scarce aquatic resources or habitat. Therefore, a score of zero is assumed for this factor.

In summary, a PAF of 0.9 is justified for the Preservation Area. There is no time lag or risk associated with the Preservation Area as the land is currently available for preservation and required preservation instruments would be put in place prior to construction. This value along with scores approaching 1.0 for both the value of the Preservation Area and the difference/delta between the preserved versus existing conditions, demonstrates that using USACE's Methodology would result in credits of approximately 0.9 for every acre of preservation.

In addition, Donlin Gold is also proposing immediate restoration of high value wetlands and stream channels through the Upper Crooked Creek PRM Plan that would create lift of wetland and stream functions in-watershed. As a result, the proposed wetland mitigation and impact ratios of approximately 2.2:1 for acres (including both wetlands and upland riparian buffers) and 1.6:1 for streams, considering the Upper Crooked Creek and Chuitna PRM Plans provide more than sufficient compensatory mitigation for the Project impacts.

9.0 Summary of Mitigation Program Credits

Wetland mitigation credits will be purchased from Great Land Trust. There are just under 5 acres of permanent wetland fill impacts associated with the PA in the Matanuska Susitna Borough (in Great Land Trust's service area). Using methods approved by the Alaska USACE District the acres of wetland impact in the MSB have been converted to 9.8 credits needed from Great Land Trust. Donlin Gold has secured an option to purchase these. The 9.8 credits to be provided are summarized in Table 23. Donlin Gold will submit a receipt proving purchase of the wetland credits to USACE prior to the start of construction authorized by the DA Project permit. An example receipt is included in Figure 12. Donlin will provide a letter of credit availability to the USACE PM prior to rendering a permit decision (expected by the end of July 2018).

Table 23 *Summary of Wetland Credits for Purchase from the Great Land Trust*

HGM Wetland Credit Type	Credits
Riverine	3.6
Slope	6.2
Total	9.8

10.0 Conclusion

Donlin Gold proposes this CMP to compensate for unavoidable permanent fill impacts to wetlands and streams within the MA, TA, and PA. This CMP includes an in-kind, in-watershed PRM Plan in the Upper Crooked Creek watershed. The Upper Crooked Creek PRM Plan includes the enhancement, reestablishment, restoration, rehabilitation and preservation of 221.5 acres of wetlands, riparian areas, stream channel, and uplands. The PRM Plan will restore degraded wetland acreage in Quartz, Snow, Ruby and Queen Gulches, and at the Wash Plant Tailings Area. The PRM Plan will restore 95.7 acres of degraded floodplains into 92.3 acres of wetlands and 2.7 acres of riverine channel. A total of 8,892 liner feet of stream will be enhanced and reestablished by the restoration work in the floodplains. Within the wetland floodplains, 15.2 acres of off channel ponds will provide improved aquatic resource habitat. In addition, 16.8 acres of adjacent upland terrestrial habitat will be created. A total of 109 acres of riparian uplands and wetland buffers will be preserved around the restored and enhanced floodplain wetlands. This PRM Plan will be initiated concurrent with the start of MA construction. Through the Upper Crooked Creek PRM Plan, and more broadly Donlin Gold's efforts to confine all MA activities to two drainages that support limited aquatic habitat and fish populations, there will be no significant impacts to aquatic resources at the watershed level. The Upper Crooked Creek Permittee Responsible Mitigation Plan is included in Attachment D.

A small portion of project impacts along the natural gas pipeline fall within the service area of at least 2 mitigation credit providers. Donlin Gold has committed to secure 9.8 credits from the GLT to offset the 5 acres of permanent impacts to wetlands identified in their service area.

Donlin Gold conducted an extensive process to identify and pursue off-site, in-kind compensatory mitigation options to provide additional wetland acres and stream feet mitigation credits. Each option was considered in terms of wetland and stream values, feasibility of land acquisition and long-term protection, and, for restoration, likelihood of success, and, for preservation, threat of development. The results of the evaluation led to the Chuitna Preservation Area. Under this PRM Plan, Donlin Gold will ensure protection of 5,870 acres, including 3,269 acres of wetlands and ponds, and 418 acres of streams and rivers, totaling 3,687 acres of WOUS. It also protects 2,183 acres of upland riparian area and buffers, and 258,056 linear feet (48.8 miles) of streams in the Chuitna watershed. The Chuitna Preservation Area includes: 29 acres of estuarine fringe HGM wetlands, 70 acres of depressional HGM wetlands, 500 acres of riverine HGM wetlands, and 2,661 acres of HGM Slope wetlands. Within the Slope HGM wetlands there are 802 acres of ericaceous shrub bog-string bog wetlands which are a unique wetland type to the area, and only occur in a few very specific locations worldwide. The Preservation Area includes protection of important anadromous and resident fish habitat protection at the watershed level from

near-term threats of natural resource development. The PRM Plan will also help to protect critical habitat of the endangered Cook Inlet Beluga whale. The Chuitna PRM Plan is included in Attachment E.

For the PRM Plans, the proposed compensatory mitigation for wetlands by HGM class and Cowardin group is shown in Table 24. The compensatory mitigation proposed for streams is shown in Table 25. Overall, Donlin Gold's has proposed a compensatory mitigation ratio for long-term and permanent fill impacts of 2.2:1 for acres (including both wetlands and upland riparian buffers) and 1.6:1 for streams. This does not include the 9.8 mitigation credits to be provided by Great Land Trust's mitigation credit Program (see Table 26).

Based on the USACE regional and national guidance; current regulations; wetlands and streams proposed for restoration, enhancement, and preservation; the compensatory mitigation proposed by Donlin Gold is sufficient to support DA permit issuance.

Table 24 *Compensatory Mitigation Proposed for Wetlands by HGM Class and Cowardin Group (Acres)*

	Classification	Chuitna Preservation Area	Upper Crooked Creek Restoration	Upper Crooked Creek Preservation
Wetland HGM (Cowardin Classes)	Depressional (PAB, PEM, PFO, PSS, PUB)	79	0	1.6
	Estuarine Fringe (E2EM, E2US)	29	0	0
	Flat (PEM, PFO, PSS)	0	0	32.7
	Riverine Non-Anadromous (PEM, PFO, PSS, PUB)	76	93.0	0
	Riverine Anadromous (PEM, PFO, PSS, PUB)	424	0	17.9 ¹
	Slope (PEM, PFO, PSS)	2,661	0	11.6
Totals	Wetlands and Ponds	3,269	93.0	63.8
	Stream and River Area	418	2.7	0.9
	Upland Riparian and Buffers	2,183	16.8	44.1
Total of Parcel		5,870	112.5	109

¹Riverine wetland are adjacent to Crooked Creek.

*Inconsistencies are due to rounding.

Table 25 *Compensatory Mitigation Proposed for Streams in Linear Feet (Miles)*

HGM	Chuitna Preservation Area	Upper Crooked Creek Restoration	Upper Crooked Creek Preservation
Anadromous Stream Channel	196,292 (37.2)	0	0
Non-Anadromous Stream Channel	61,746 (11.7)	8,982 (1.7) ¹	4,036 (0.8)
Total	258,056 (48.9)	8,982 (1.7)	4,036 (0.8)

¹The return of anadromous salmon to restored streams is expected but cannot be accurately predicted in terms of specific stream length. Post-restoration monitoring will verify presence or absence of anadromous and resident fish.

*Inconsistencies are due to rounding.

Table 26 *Wetland Credits to be Purchased from the Great Land Trust*

HGM Wetland Credit Type	Credits
Riverine	3.6
Slope	6.2
Total	9.8

Figure 12 Credit Purchase Receipt.



US Army Corps
of Engineers®
Alaska District

CREDIT PURCHASE RECEIPT	
Compensatory Mitigation Type: Mitigation Bank () In-Lieu-Fee Program ()	
Mitigation Provider (Sponsor):	
Service Area or Name of Mitigation Site:	
Permit Number: POA-20	USACE Project Manager:
Waterway:	
Project:	
Impact Type:	
Impact Site Location: Latitude , Longitude	
CREDITS PURCHASED	
Credit Type	Number of Credits
TOTAL CREDITS PURCHASED	0.00

Permittee's Name/Company & Signature

Date

Mitigation Provider's Name/Signature

Date

Upon completion of the fulfillment of the mitigation required by the permit, please email a copy of this signed Receipt to mitigationmanager@usace.army.mil (RIBITS Administrator) and to USACE Project Manager above.

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